FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930

May 29-June 14 Royal Tournament, Olympia.
June 6 .. Entries close for King's Cup Race.
June 7-9 .. Gliding demonstration by Herr Kronfeld, West Firle (nr. Lewes).
June 8-9 .. Vincennes Aviation Meeting.
June 8-15 .. F.A.I. Conference, Paris.
June 9 .. N.F.S. Air Meeting, Reading.
June 9 .. Northampton Flying Meeting.
June 12 .. Isle of Wight Flying Club Meeting, Shanklin.
June 14 .. Manston Garden Party.
June 19 .. N.F.S. Air Meeting, Nottingham.
June 21 .. Household Brigade Flying Club Meeting at Heston.
June 21 .. Air Rallye at Haldon Aerodrome, Teignmouth.
June 26 .. Ipswich Air Pageant.
June 27 .. R.A.F. Dinner Club Annual Dinner.
June 28 .. Royal Air Force Display, Hendon.
July 5 .. King's Cup Race and Hanworth Air Pageant.
July 17-23 "British Week" at Antwerp Exhibition.
July 19 .. N.F.S. Flying Meeting, Leeds.
July 19 .. N.F.S. Flying Meeting, Hull.
July 19 .. Air Pageant at Hanworth, in Aid of National Birthday Trust Fund.
July 20-Aug. 7 International Light 'Plane Tour of Europe, starting from Berlin.
July 26 .. Norwich Flying Meeting.
July 31 .. Entries close for 1931 Schneider Trophy Contest.
Sept. 1-6 5th International Air Congress at The Hague.
Sept. 6 .. Opening of Ratcliffe Aerodrome, Leicester.
Sept. 6-28 Aero Exhibition, Stockholm, Sweden.
Sept. 20 .. Liverpool Air Pageant.
Sept. 27 .. N.F.S. Air Meeting, Hanworth.
Nov. 28-Dec. 14 Paris Aero Show.

1932

May 31 .. Closing date for Cellon Cross-Channel Glide £1,000 Prize.

EDITORIAL COMMENT

International Touring Competition

FROM the *Aero Club von Deutschland* we have received the official list of entries for the International Touring Competition which starts and finishes at Berlin this summer (July 20-August 7). Details of the rules and regulations were given in our issue of February 21, 1930, and it may be recalled that the competition is divided into two distinct parts: a circuit of Europe, in which points are awarded for speed made good throughout the circuit, and a series of technical tests at Berlin, in which points are scored for such performances as take-off, alighting, etc.

The entries list published elsewhere in this week's issue, discloses the somewhat astonishing result that in spite of the rigorous nature of the competition (such as a tour of Europe of 4,700 miles) approximately 100 machines have been entered by six different countries. In view of the fact that the competition is restricted to machines of the light 'plane class, such an entries list is rather wonderful. Germany easily heads the list with 47 machines. France comes next with 16. Rather surprisingly, Poland comes third with 14 machines, Spain is fourth with 9 machines, England fifth with 8, and Switzerland last with 4 entries.

England is the acknowledged leading nation in the matter of light aeroplanes, and a total of 8 entries is scarcely in keeping with that position, especially when compared with Germany's "47 varieties" and France's 16. And yet the regulations for the competition are such that the greatest number of points for any individual performance are to be gained by speed in the circuit of Europe. In other words, although slower machines may collect more points in the take-off tests, for example, due to very light wing loadings, it will take a relatively fast machine to collect maximum points for average speed around Europe. In a distance of nearly 4,700 miles, with landings at some 28 places, there is plenty of opportunity for mishaps, and it is always within the bounds of possibility that all our 8 machines may be forced out of the subsequent tests.

But a nation which has entered 47 machines should be reasonably certain of getting a considerable number through. However, if a British machine does succeed in winning the competition, the honour will be all the greater for having been pitted against so many competitors.

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A Service in the Nilgiris?

An intriguing story has appeared in the press of India. It concerns a proposed air service by amphibian "Moths" between the city of Madras and the summer capital of Ootacamund in the Nilgiri hills. According to the press report, certain influential people, whose names are not divulged, are promoting an aerial transport company to bring the summer capital of the Madras Presidency within four hours' journey of the great seaport which is the capital in winter. Ootacamund stands some 7,000 ft. high in the Nilgiris, whose highest peaks are not more than 9,000 ft. This range is very unlike the precipitous Himalayas. There are rolling downs on the top of the Nilgiris where the jackal is hunted as the fox is hunted in the Shires. The Ootacamund hounds are the best known pack in India. There is also a lake at Ootacamund and application has been made to the Municipal Council for leave to use this lake as an airport for the amphibians. At the other end of the route the machines would land on wheels.

The Government of Madras would, doubtless, highly appreciate a rapid delivery of official mails. Occasional passengers would think it worth many rupees to get quickly up into cool air, reach the hills in four hours, and escape the torment of a train journey in the hot weather. But technical difficulties are another matter. Flying over hills always presents problems, and even over the Nilgiris there must be many places where an engine failure would be awkward. Then there is the question of the "Moth" getting off from a not very large lake at an altitude of 7,000 ft. That appears to us an insoluble problem.

This report, we must suppose, has been inspired by parental wishes rather than by filial thoughts. All the same, though it may for the present be a fanciful scheme, it is a very charming one. Technical progress does not stand still, and the time may not be far off when some type of aeroplane or autogiro will make this dream come true. We sincerely hope that the editorial "We" will live to see, or at least to record, the inauguration of an air service from Madras to Ootacamund.

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BIRTHDAY HONOURS

THE following are included in the official list of Honours conferred by His Majesty the King on the occasion of his 65th birthday :—

Baronet

Frederick Henry Royce, O.B.E., M.I.M.E., M.I.E.E., M.I.A.E., Founder, Director and Chief Engineer of Rolls-Royce, Ltd.

Knight

Henry William Watson McAnally, C.B., J.P., Principal Assistant Secretary, Air Ministry.

Order of the Bath

K.C.B. (Military Division)

Air Vice-Marshal David Munro, C.B., C.I.E., M.B., Ch.B., F.R.C.S.(E.), R.A.F. (Retired).

Order of the British Empire

Military Division

K.B.E.

Colonel Henry Davies Foster MacGeagh, C.B.E., T.D., K.C., Officer in charge of Military and Air Force Department, Office of the Judge Advocate General, War Office.

C.B.E.

Wing Commander Harold Edward Whittingham, M.B., Ch.B., F.R.F.P.S. (G), M.R.C.P. (E), D.P.H., D.T.M. and H., R.A.F.

O.B.E.

Wing Commander William Millet, R.A.F.
Squadron Leader Hugh Leedham, R.A.F.
Squadron Leader Alan George Bishop, A.F.C., R.A.F.

M.B.E.

Flight Lieutenant Sidney James Bailey, R.A.F.
No. 472 Sergeant-Major Alfred Box, 1st Class, R.A.F.
No. 798 Sergeant-Major Frank Lamdin, 1st Class, R.A.F.
No. 7677 Sergeant-Major Laurence Richard Fears, 1st Class, R.A.F.

(Civil Division)

C.B.E.

Miss Amy Johnson, in recognition of her outstanding flight to Australia.

O.B.E.

Archibald Havergal Downes-Shaw, Chairman of the Bristol and Wessex Light Aeroplane Club.

Royal Air Force

Bar to Air Force Cross

Squadron Leader Augustus Henry Orlebar, A.F.C.

Air Force Cross

Squadron Leader Alan Lees.
Flight Lieutenant Henry George Watts Lock, D.F.C.
Flight Lieutenant Alfred Randles Wardle.

Princess Mary's R.A.F. Nursing Service

Royal Red Cross (First Class)

Miss Katherine Christie Watt, Matron, Princess Mary's R.A.F. Nursing Service, in recognition of exceptional devotion and competency displayed in Royal Air Force hospitals at home and in Iraq.

Royal Red Cross (Second Class)

Miss Esther Wilson Hunter, Sister, Princess Mary's R.A.F. Nursing Service, in recognition of special devotion and competency in the performance of nursing duties in the Palestine General Hospital, Sarafand.

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At St. James's Palace

BY Command of the King a Levée was held on June 2 at St. James's Palace by the Prince of Wales, on behalf of His Majesty. Air Marshal Sir E. Ellington, Principal Air Aide-de-Camp, was amongst those in attendance upon His Royal Highness. Others present were Air Marshal Sir Sefton Brancker, Group Captain L. W. B. Rees and Wing-Commander Louis Greig. The following were amongst those presented to the Prince of Wales :—Sqdn.-Ldr. N. Buckeridge, Sqdn.-Ldr. R. Chappell, M.C. ; Sir Alan Cobham, K.B.E., A.F.C. ; Wing-Commander G. Cooke, D.S.C., A.F.C. ; Group Capt. H. Cooper, D.S.O., M.R.C.S., K.H.S. ; Air Commodore P. Joubert de la Ferte, C.M.G., D.S.O. ; P/O. M. de Satgé ; Air Vice-Marshal H. Dowding, C.B., C.M.G. ; Group Capt. C. Edmonds, D.S.O., O.B.E. ; Air Commodore P. Fellowes, D.S.O. ; Sqdn.-Ldr. J. L. Findlay, M.C. ; Group Capt. I. Fowler, A.F.C. ; Flight-Lieut. C. Grace ; Sqdn.-Ldr. E. Grenfell, A.F.C. ; Flight-Lieut. C. Guest ; Flight-Lieut. H. Heslop ; Flight-Lieut. A. Hull ; Flight-Lieut. F. Mellersh, A.F.C. ; Air Commodore W. Mitchell, C.B.E., D.S.O., M.C., A.F.C. ; Group Capt. E. Nanson, C.B.E., D.S.O., A.F.C. ; Group Capt. H. Nicholl, C.B.E. ; Group Capt. L. Pattinson, D.S.O., M.C., D.F.C. ; Group Capt. W. Primrose, D.F.C. ; Flight-Lieut. H. Reid, D.F.C. ; Flight-Lieut. G. Richardson ; Flight-Lieut. F. Rowe ; Flight-Lieut. A. Sanderson, D.F.C. ; Flight-Lieut. E. Spence ; Sqdn.-Ldr. T. Studd, D.F.C. ; Sqdn.-Ldr. R. Sugden, A.F.C. ; Flight-Lieut. A. Tattersall ; Flight-Lieut. H. Thornton ; Flight-Lieut. F. Vernon ; Group Capt. W. Welsh, D.S.C., A.F.C. ; Sqdn.-Ldr. H. White ; Flight-Lieut. C. Wincott, etc.

PRIVATE FLYING AND CLUB NEWS

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THE BRISTOL OPENING

BRISTOL arrange a truly international meeting with which to herald the opening of their new municipal Airport at Whitchurch by Prince George on Saturday last, May 31. On the Friday morning several foreigners arrived, and a Continental *rallye* was held for their benefit. There were two prizes for the competitors starting from the farthest point, the first being the "Mobiloil" Cup and £15, and the second £5. These were won by R. Neininger on the Darmstadt D-1561 (Genet engine) and J. Mans on a St. Hubert (Walter engine). There were a further two prizes for those who in the opinion of the judges made the best individual effort and/or performance. The first of these was £15, and was won by L. Lammertz on a Pander (Gipsy engine), and the second, £5, by Comte A. Looz-Corswarem on a St. Hubert (Walter engine).

This is the first time the Darmstadt machine has been over here, and it aroused a great deal of interest. It is a cantilever biplane of small size, and appears to be very efficient aerodynamically. The wings are single-spar construction and the fuselage is monocoque, consequently a very good streamline shape is obtained. With the Genet engine and two passengers the top speed is said to be something over 125 m.p.h.

Among the other foreign visitors were Messrs. Reginensi and Bailly on the Farman monoplane (Salmson engine) which they recently flew to Madagascar and back. The Air Union also sent down a Loire et Olivier machine from their Golden Ray service with Renault engines, and through the courtesy of Mr. Bamford we were given the pleasure of going to the meeting by this means. The L.e.O. people have certainly solved the problem of making comfortable seats and there is plenty of leg-room between them, but it does seem a pity that more attention is not paid to providing passengers with a better view. For, after all, one of the great joys of travelling by air is being able to get a perfect view of the country over which you are passing, and when this is not possible there is not much left to attract people to this form of transport except the more mundane reason of speed on the journey. In the Golden Ray the entire cabin window is blocked out by the engine and its mounting on each side, so that only with the greatest difficulty can the passengers get glimpses of the country. Apart from this point the machine was very comfortable, and on the journey down was flown by that well-known pilot M. Bajac.

ROYAL PATRONAGE: H.R.H. Prince George, who opened the Bristol Airport, being welcomed by the Lord Mayor of Bristol, on his left, and Mr. A. Downes-Shaw, Chairman of the Bristol and Wessex Aero Club, on his right. (FLIGHT *Photo.*)

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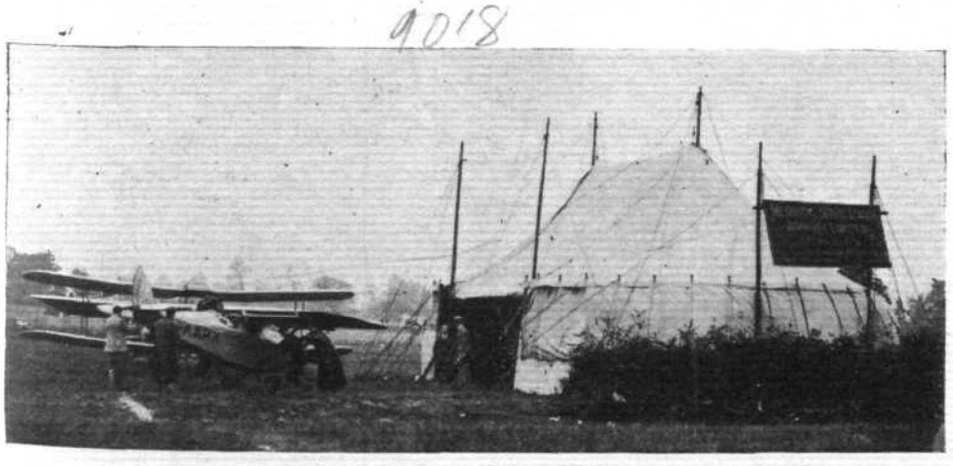


SERVICE: Airwork Ltd. had this special hangar erected to provide any service required by the visitors. (FLIGHT *Photo.*)

During the Friday afternoon the heats for the "Bristol Aerial Derby" were run off.

The airport at Whitchurch is only four miles from the centre of the city, and when a new arterial road which is being constructed is finished it will be possible to reach the city in a very few minutes.

The opening of the aerodrome coincided with the British–French week which Bristol is holding, and formed the first of a series of attractions which have been arranged for the many visitors who have come over from that country.

GOOD HANDICAPPING: A tight finish during the heats for the Bristol Aerial Derby. (FLIGHT *Photo.*)

As things are at present there is little to distinguish Whitchurch from any other well-run aerodrome, but provision has been made for complete development when the volume of traffic warrants it. There is now a large hangar with workshops where overhauls can be carried out, and the amenities of the club-house of the Bristol and Wessex Aeroplane Club are available to all flying visitors. Merlyns Motors are running a showroom on the aerodrome and are agents for Moths, and, of course, supplies of the best brands of oil and petrol are to hand.

The programme had to be very largely washed out as the rain and low clouds made flying almost impossible, but it was just possible to carry through a few impromptu events.

Prince George arrived in a Westland Wapiti escorted by a similar machine, three Siskins, and a Fairey III F. After opening the Winford Orthopædic Hospital he then returned to the aerodrome, and from the club-house roof declared it open. This ceremony was enlivened by a downpour which lasted for most of the meeting and literally washed out the meeting as a meeting. Prince George in his opening speech said that very little imagination was needed to foresee the great future which lay before an airport in this part of the country. Already the West was a noted centre for aircraft manufacturers, and many other firms of repute were established there, so that the establishment of Bristol as an airport would certainly result in increasing its importance. It was, he said, quite in keeping with the pioneering spirit always shown by Bristol that they should now support this latest form of enterprise, and he hoped that the citizens would be among the first to reap the benefits which the establishment of such an airport would be sure to bring and that it would lead to the export of British aeroplanes and engines to all parts of the world.

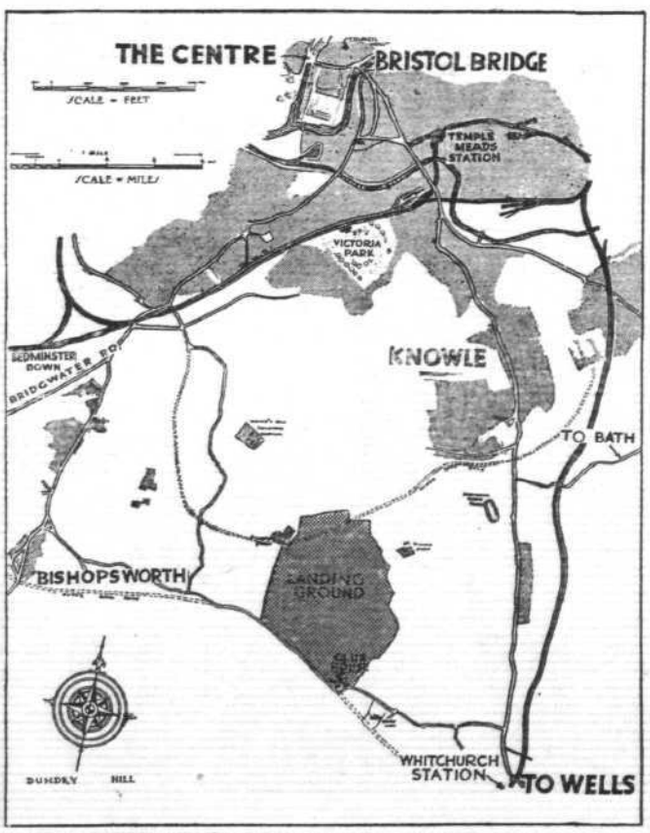
Following this there was a parade and fly round of many types of machines. First there was the D.H.53 followed by the Comper Swift, a Blackburn Bluebird, a D.H. Moth, an Avro Avian, a Simmonds Spartan, a Parnall Elf, a D.H. Puss Moth, a Breda, a Desoutter, an Avro 504 K, the H.P. "Gugnunc," and the Air Union's Le O. Golden Ray machine. The Handley Page W 10 "City of Bristol" was also there, and had been joy riding hard, and continued to do so until dark, as did the Avros of the Cornwall Aviation Co.

The R.A.F. display, which should have been next, degenerated into a formation flight by three Siskins. In spite of the weather they kept beautiful formation and went through as many variations as was possible under the conditions.

Flt.-Lt. J. Armour and Mr. S. A. Thorn then went and bombed an Austin Seven, and it looked from where we were as if several direct hits were obtained. Later in the day Flt.-Lt. Armour did some crazy flying which was really magnificent and quite reminiscent of the things we used to see Sqd. Ldr. Noakes doing.

Sqd. Ldr. England took up the Gugnunc and showed that it is capable of flying slowly at large angles and of landing slowly and gliding steeply.

Capt. Broad, who had brought his special aerobatic Moth down, did some inverted flying, but was of course greatly handicapped by the low clouds, which also hampered Mr. Blake when he took up the Lincock, because even with a small zoom he was at once lost to sight. His trick of making a zoom, and then bringing the machine round in three complete



A SENSIBLE SITUATION: The dotted line shows the new arterial road to the City.

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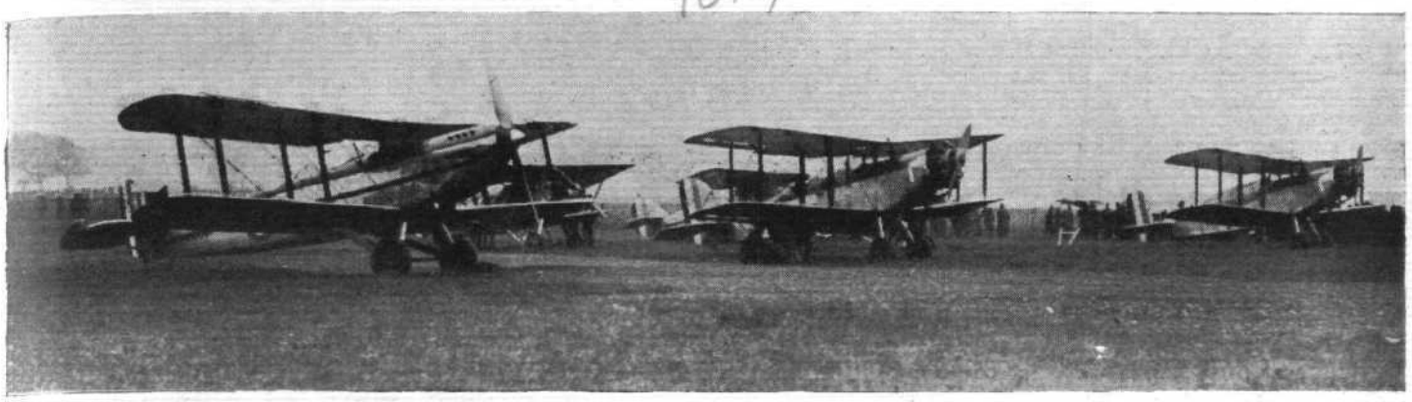


ROYAL TRANSPORT: The Wapiti used by Prince George is on the right with the escort machines lined up alongside. (FLIGHT *Photo.*)

upward spins just before the top of the zoom is very spectacular.

The last event was the final of the Aerial Derby. There were some 28 entries for this race, and the first three in each heat were in the final. The race was a supreme effort of the handicappers, Messrs. Dancy and Rowarth, and as will be seen from the table below, less than a minute covered the first seven finishers. When it is realised that the machines with which they had to deal ranged from the Bulldog to the D.H.53, it will be seen that handicapping can have been no easy task. Seldom have we seen a more spectacular finish without undue danger, and it was the greatest pity that the weather had made many of the spectators leave the aerodrome.

Some thousands of cars were in the enclosures, also a very large crowd of spectators. The arrangements made for their benefit were, on the whole, very well done, but it seemed as if there was a danger of organising things just a little too far. For instance, although the Prince was not due to arrive until 2.30 p.m., yet the club house was entirely closed to members from the morning. Another point which seemed somewhat unnecessary was putting the petrol companies the whole width of a field away from the machine park so that they had to cart all their cans across the intervening space. Then the food arrangements in the chief enclosures were distinctly lacking. Apart from the official tent where those who had been invited by the Mayor to lunch were supplied, there was only a buffet tent where sandwiches of ample proportions and liquid refreshment could be obtained.

Airwork of Hestons had an official service depot there close to the machine park with many notice-boards showing the way to it, which showed the initiative of this firm.

Machine.	*Start.*	*Finish.*	*Speed.*	*Place.*
	min. sec.	min. sec.	m.p.h.	
XN	13 02	29 28	65	—
BVZ	8 52	25 30	90½	4
TV	7 59	25 17	95	2
AVZ	6 0	25 42	100	—
RQ	6 24	25 02	104¼	1
VL	6 24	25 55	99½	—
RM	5 13	25 24	109	—
D1561	2 32	26 11	122	—
AC	Scr.	25 25	155	3

Registration	*Aircraft*	*Entrant*	*Pilot.*
G-EBXN	D.H. 53 (Cherub)	R.A.E.Ae.C.	Flt.-Lt. T. Bruce.
G-EBVZ	Avian (Cirrus II)	Miss W. Brown	Entrant.
G-EBTV	Moth (Cirrus II)	Bristol and Wessex Ae.C.	E. Bartlett.
G-AAVZ	Moth (Gipsy I)	London Ae.C.	Capt. F. Matthews.
G-EBRQ	Widgeon III (Genet)	"J. Wellworth"	Entrant.
G-AAVL	Breda (Gipsy I)	International Aircraft	A. Store.
G-EBRM	Widgeon III (Hermes)	R. Cazalet ..	Entrant.
D-1561 ..	Darmstadt D.18 (Genet)	Academische Fliegergruppe	R. Neininger.
G-AAAC	Bulldog (Jupiter)	Bristol Aeroplane Co.	C. Uwins.

THE BRITISH GLIDING ASSOCIATION.—An extraordinary general meeting of the members of the B.G.A. will be held at the Library of the Royal Aeronautical Society, 7, Albemarle Street, W.1, on June 12, 1930, at 6.30 p.m.

THE ESSEX GLIDING CLUB held their inaugural meeting at the Royal Forest Hotel, Chingford on Monday, May 26, and it was unanimously decided to form the club. All who wish to become members (flying or honorary) and reside in this county should apply to the Hon. Secretary, 20, Badlis Road, Walthamstow, Essex.

NORTHAMPTONSHIRE AERO CLUB. The annual meeting arranged for Whit Monday promises to be one of the best meetings of the year—as usual!—and a very carefully thought-out programme should attract more than the usual crowd to Sywell aerodrome.

THE CARLSBAD Local Group of the Masaryk Air League are holding a three-day meeting at Carlsbad on June 7, 8 and 9, and an excellent programme has been arranged in which military machines will participate. There will also be several competitions in which all foreign visitors are invited to take part.

THE ASHWELL-COOKE CUP.—The competition for the Ashwell-Cooke Cup, which should have been held at Lympne on Sunday, June 1, was postponed on account of low cloud, and will be held at 3.30 p.m. on Sunday, June 15, being the first Sunday after Whitsun. It is hoped that all private owners will make a note of this date, and that there will be a good field of competitors.

THE CLOUDCRAFT GLIDER COMPANY, Rowlands Buildings, St. Mary's Road, Southampton, has just been formed, and will be the sole manufacturers of Dickson gliders and sailplanes, and are now able to accept orders for the standard training glider, as published in FLIGHT. High performance sailplanes will also shortly be produced.

This company will be pleased to design and build to B.G.A. requirements any special engineless aircraft to individual requirements of customers.

All materials used will be up to Air Ministry standards.

For those who wish to build their own gliders, blue prints of the training type machine will shortly be available from FLIGHT office.

AN OXFORD GLIDING CLUB. One of the latest additions to the number of gliding clubs that are being formed in different parts of the country is the Oxford and County Gliding Club, whose members so far are mostly from the personnel of the Morris Motor Works at Cowley.

Sir William Morris is showing a practical interest in aviation by having become a patron of this club, and the work of constructing the first glider is well under way.

Mr. H. T. Beasley is Chairman, and the offices of the club are in Circus Street, Cowley, where a two-storey workshop has been rented.

It is hoped to have the glider in the air in July. Persons in the vicinity of Oxford who are interested in gliding are welcome as potential members providing they are willing to pull their weight as workers.

THANKS FROM BRISTOL. We have received the following from the airport manager at Bristol:—"The organisers of the Bristol International Air Pageant, which was held on May 31, wish to express to all visiting pilots their great appreciation of the manner in which competitors, demonstrators and visitors enabled the programme to be carried through, in spite of the unfortunate weather conditions. The fact that the curtailed programme was completed was mainly due to the cheerful co-operation and spirit of endurance of the visiting pilots, to whom weather conditions appeared to be of small importance."

THE LONDON GLIDING CLUB.—On Saturday, May 31, the imported "Prüfling" intermediate soaring machine was delivered, and after erection was tested by three members who, after their experience with the Zögling, were all agreeably surprised with the sensitiveness of the controls.

Saturday evening was devoted to assembling the *Daily Express* "Professor" type of soaring machine, which it was hoped would give a demonstration of soaring flight on the following day, in the hands of Herr Kronfeld. Unfortunately, however, weather conditions made this impossible, as Herr Maggisuppe assured us that for proper soaring, the "Professor" requires a fairly high wind.

On Sunday, the club held a luncheon in honour of Herr Kronfeld, and were also honoured by the presence of Colonel and Mrs. Forbes Sempill, and Mr. Gordon England, the Chairman of the B.G.A. After lunch, the company adjourned to Ivinghoe Beacon, where Capt. Needham, our first "B" licence glider pilot, demonstrated the Club "Prüfling" with considerable skill.

Shortly afterwards, Capt. Needham's own machine, the "Albatross" arrived from Guildford, and impressed all present by its easy method of assembly and extreme portability. It was first tested on level ground by Capt. Needham (its designer), under the guidance of Herr Kronfeld, who gave us all much valuable advice concerning methods of assembly and launching. After a series of gentle slope trials, it was transported to the Beacon, when it made a really excellent flight, and showed itself to have a truly astounding gliding angle. The Club will not operate at Ivinghoe next week-end as both the Prüfling and the "Albatross" are being sent to Itford Hill, where, by courtesy of the B.G.A., our Club instructors are to receive instruction from Herr Kronfeld in the art of soaring.

Of the membership, which is increasing steadily, it is interesting to note that some 50 per cent. have had no previous aviation experience.

All enquiries about the Club should be sent addressed to The Hon. Sec., 44A, Dover Street, W.1

ENTERPRISE IN CANADA: An Avro Avian Seaplane (Genet Major) on the Ottawa River.

WOMEN PILOTS AND THE LONDON AEROPLANE CLUB. It is worthy of note that all the most famous women pilots in the British Empire—if not in the world—graduated from the London Aeroplane Club. Lady Heath was the first woman to hold a "B" licence, entitling her to fly for hire or reward; Lady Bailey's solo flight to the Cape via Egypt and back by the West Coast of Africa was the longest and probably the most remarkable flight ever performed by a woman; Miss Winifred Spooner (also a "B" licence pilot) is the holder of the Challenge Cup of the S.B.A.C., the winner of many other prizes, and Miss Amy Johnson is the first woman to fly solo to India and Australia.

All these learnt their flying and obtained their licences with the L.Ae.C. which has produced more than 200 new pilots (including many women) since its incorporation less than five years ago. In view of the tact that a start was made with only two Moth aircraft of the original low-powered type and a small shed for the accommodation of both aircraft and members, and that financial assistance from the Government has never exceeded £2,000 per annum, the results achieved are rather remarkable. The Club, which was one of the pioneers of the Light Aeroplane Club movement which has spread all over the world, now owns seven modern aircraft and a club-house, performs 3,000/4,000 hours flying per annum, provides flying facilities at 20s. per hour for solo work, and each year has shown a steady increase in the scope of its activities.

THE NEWCASTLE MECHANICAL CLUB has founded a gliding section and those interested should apply to Alfred P. Miller, Hon. Secretary, 27, Philiphaugh, Wallsend-on-Tyne, Northumberland.

LANCASHIRE AERO CLUB.—During the week ending May 17, only two Avro Avians were in service, but in spite of this, the Club has succeeded in beating its own record for a week's flying.

Sixty-four hours 50 min. were flown, as against the previous record of 58 hr. 10 min.; 15 hr. 10 min. were flown on a weekday (Tuesday), and six pupils were successfully launched on their first solo flights. In addition to the foregoing, three members gained their pilot's certificates.

Each of the foregoing constitutes a record for the Club, but the records are not likely to stand for long, as there are now four machines in service and a fifth is due to arrive this week.

So many new flying members have joined the Club recently, that it has been found necessary to appoint a temporary Assistant Instructor to cope with the situation. Mr. Oliver, who recently deputised for Mr. Hall while the latter was recovering from a fractured knee-cap, is now acting as Assistant Instructor, and it is largely due to these two that the records have been set up .

The Club entered two machines for the Bristol Flying Meeting, which marked the opening of the new Municipal Aerodrome at Bristol, on May 31. By a happy coincidence the two machines entered were the De Havilland Moth G-EBMQ, the oldest machine of the Club's fleet, and the Hermes Avro Avian G-AAWI, which is the very latest addition to the fleet. MQ was presented by Lord Wakefield, the President of the Club, in February, 1926, and WI in May, 1930.

Negotiations with Mr. J. D. Siddeley, of the Armstrong Siddeley Development Co., Ltd., and with A. V. Roe & Co., Ltd., in connection with the Clubhouse extensions are now well advanced, and the Club members would like to place on record their appreciation of the kindness and considerations shown by the above-mentioned in the matter.

THE DORSET GLIDING CLUB.—Inaugurated on April 3, the Dorset Gliding Club has made good progress, and is now carrying out flying!

Meetings are held three days a week, weather permitting, at Up Cerne, Cerne Abbas, Dorset. The club possesses an R.F.D. type glider and hopes to acquire a second machine soon. The club has over 30 members and expects to touch the 50 mark within the next few weeks. Already it has passed county bounds, attracting members from Somerset, Wilts and Hants.

The flying ground at Up Cerne, lies just off the main Sherborne-Dorchester road near Cerne Abbas, and is within easy reach of a large area of the South West.

Among those who have joined the Club are Mr. R. A. Bruce, O.B.E., managing director of Westlands Aircraft Works, Yeovil, Capt. G. T. R. Hill, M.C., Mr. H. J. Penrose, and Mr. V. S. Gaunt.

A RADIO RESEARCH MACHINE: Mr. Vincent de Ferranti leaving the Hollinwood works of his firm in their D.H. Moth (Gipsy).

THE SURREY GLIDING CLUB held its first meeting on Saturday, May 24, and were visited by Capt. Needham who demonstrated his machine by giving flights of 35 to 40 sec. During the week-end some 83 short flights were made by members who, by the way, were all novices and had no previous experience of flying. The machine, an R.F.D. type A.T., behaved perfectly, and the club will continue meetings every week-end until further notice, weather permitting. The Hon. Secretary is Mr. C. H. Taylor, whose address is 24, Woodbridge Hill Gardens, Guildford.

The President of the Club is the Mayor of Weymouth, Mr. Percy Boyle, M.B.E.

When the Club as a whole has gained more experience, soaring will be carried out on the West Dorset downlands, adjoining the monument to Capt. Hardy, Nelson's beloved officer.

Until June 1 next, the Club entrance fee is 2*s.* 6*d.*, but becomes half-a-guinea after that date. The annual subscription is a guinea. Non-flying facilities are granted to subscribers of half-a-guinea or more. Mr. H. Campbell Johnston, 4, Derby Street, Weymouth ('Phone Weymouth 352), is the Hon. Sec.

THE KENT GLIDING CLUB was treated to a lecture by Herr Kronfeld, the German gliding expert, when he visited them on Friday, May 30. This is the first lecture he has delivered in England, and his lecture, which was illustrated with lantern slides, was much appreciated by those present. Herr Kronfeld has brought over his own soaring machine, the "Wien," and it is hoped that he will shortly carry out demonstrations in different parts of the country. The first of these will be at West Firle, near Lewes, on Whit Saturday, Sunday and Monday, June 7, 8 and 9. The demonstrations will be, weather permitting, at 2.30 p.m. each day.

THE CATERPILLAR AIR CHUTE

A New Irvin Air Chute for Private Owners

THE Irving Air Chute of Great Britain, Ltd., who manufacture the standard parachutes for the Royal Air Force, announce a new parachute, which has been specially produced for private owners and air travellers generally. It is appropriately called "The Caterpillar Air Chute," taking this name, of course, from the title of the International Caterpillar Club, which is the exclusive club of airmen or airwomen who save their lives with an Irvin Air Chute. Its membership is nearly 300.

Private owners, members of flying clubs, and the entire happy group of flying enthusiasts associated with the civil flying movement in this country, are now such an important section of aviation that the necessity for studying their specific requirements is in evidence in many directions, for they are creating their own special conditions, which must be met with special equipment.

Parachutes have now a public reputation. They have emerged from the obscurity of the past. We have almost daily evidence of their efficiency. They are serious contributors to the safety factor in modern aviation.

This is made clear by the interest of private owners in parachutes. We know that already in several types of light aeroplanes (Gipsy-Moths and Blackburn "Bluebirds" are examples), parachute seats are the standard seats. Incidentally, it is to the point to mention here, that owners of aircraft which are not fitted with these seats, are not thereby prevented from wearing a parachute. The only reason that a special seat is now being fitted is for the comfort of an airman wearing a parachute. Ordinary seats are, of course, usually flat, which, therefore, do not hold a pack firmly when the airman is sitting on it. But the question of comfort is the only reason for a special seat. Miss Amy Johnson wore an Irvin Air Chute for her magnificent flight to Australia in 20 days without having the ordinary flat seat altered. In designing a new parachute for private owners and all civilian airmen, the Irving Air Chute of Great Britain, Ltd., set themselves fixed objectives. First, the Caterpillar Air Chute had to be produced with the same high quality of workmanship as in their standard parachutes for the Royal Air Force. Secondly, the Caterpillar Air Chute had to be cheaper.

Now, when you produce a cheaper equipment, it is generally assumed that the equipment is not of the original high class standard; but that is a wrong assumption in this case. The Caterpillar Air Chute is an all-silk parachute, like the standard types—that is, perhaps, the most important fact to note. It is possible, for instance, to produce a good and fairly reliable parachute with cotton, but it remains an inferior parachute to a silk parachute, whatever minor advantage it may have, which is chiefly cheapness. The tearing strength of silk is far higher than that of cotton; so to maintain a high degree of strength and therefore a high factor of safety, the Caterpillar Air Chute is all silk.

Another important feature is its performance. It descends slower than the ordinary types. This will hearten many potential parachutists. There is a common delusion that the impact of landing with a parachute is hard. It is sometimes hard if you do not land the right way—if you attempt to resist the impact you feel the jolt—but if you allow yourself to be landed with your body limp there is no shock. Sqdn.-Ldr. K. C. H. Warner, R.A.F. Chaplain at Abu Sueir, Egypt, who saved his life with an Irvin Air Chute last January, stated in his report that he landed on his left shoulder after the manner of a fall at Rugger, without feeling the slightest shock. But whatever the degree of impact is, if it is possible to decrease the rate of descent, it should be done. So the Caterpillar Air Chute has a slower rate.

The next most important consideration in the arrival of this parachute is its price; it only costs £60, which represents a considerable reduction. This Caterpillar Air Chute is identical in size and weight with the other types. It fits in the same size pack and it embodies the same method of operation. Anyone using a Caterpillar after using other Irvin types will find no difference except in what he has to pay for it, and the rate of descent.

A standard back pad is supplied with the Caterpillar Air Chute, which fits in the usual way underneath the back section of the harness and on the airman's back. But this pad gives another advantage besides comfort. It holds the Caterpillar Air Chute across the back of the cockpit seat so that the airman may always keep his chute in the cockpit and simply slip into the harness as he sits down, as simply and conveniently as securing the safety belt.

The Irving Air Chute of Great Britain are prepared for immediate production of the Caterpillar Air Chute.

ENTRIES FOR THE INTERNATIONAL TOURING COMPETITION (JULY 20—AUGUST 7)

GERMANY

Competition No.	Entrant.	Aircraft.	Engine.	Pilot.
A1	Verein f. Luftfahrt, Gladbach	BFW M23*b*	72-80 h.p. SH 13	—
A2	Leichtflugzeugbau Klemm G.m.b.H., Böblingen	Klemm L 26 V	80-100 h.p. Argus As 8	Spengler.
A3	" " " "	Klemm L 25 E	" "	Lusser.
A4	Rhein. Luftfahrtindustrie G.m.b.H., Krefeld	R.K. 29 Deutsche Motte	SH 14	Raab.
A5	Paul Ebner, Berlin	De Havilland Moth	98 h.p. Gipsy I	Ebner.
A6	Leichtflugzeugklub München e.V.	Phœnix L 2	SH 13	Frl. Schultes.
A7	Dr. von Langsdorff	Phœnix-Meteor	SH 14	v. Langsdorff.
A8	Junkers-Flugzeugwerk A.G., Dessau	Junkers " Junior " A 50	80-88 h.p. Genet	—
A9	" " " "	" "	"	
B1	Oesterr. Phœnix Flugzeugwerft G.m.b.H., Vienna	Phœnix-Meteor	SH 14	Kielhausen.
B2	" " " "	"	"	Guritzer.
B3	Deutsche Verkehrsfliegerschule G.m.b.H., Braunschweig	BFW 23*b*	Argus	Morzik.
B4	" " " "	Arado L 2*a*	"	Stutz.
B5	" " " "	Albatros L 101	"	Steindorff.
B6	Düsseldorfer Aeroclub	Klemm L 25 I	40 h.p. Salmson AD	Carl Sönning.
B7	Luftdienst. G.m.b.H., Berlin	Klemm L 25*a*	40 h.p. Salmson	Osterkamp.
B8	" " "	Klemm L 25*c*	Argus As 8	Poss.
B9	Fr. W. Siebel, Berlin	"	"	Oskar Dinort.
C1	" " "	"	"	Oscar Notz.
C2	Ing. Ferdinand Graf Starhemberg, Salzburg	BFW 23*c*	"	Graf Starhemberg.
C3	Frhr. von Freyberg, Berlin	"	"	Egloff Frhr. von Freyberg.
C4	Bayerische Flugzeugwerke A.G., Augsburg	BFW M 23*c*	SH 13	Offermann.
C5	" " " "	"	"	—
C6	" " " "	"	"	—
C7	" " " "	"	Argus	—
C8	Arado Handelsgesellschaft m.b.H., Berlin	Ar L II*a*	"	—
C9	" " " " "	"	"	Peschke
D1	" " " " "	"	"	—
D2	Albatros Flugzeugwerke G.m.b.H., Berlin	L 100	"	—
D3	" " " " "	L 101A	105-115 h.p. Cirrus Hermes	—
D4	Akademische Fliegergruppe Darmstadt e.V.	D 18	100 h.p. Genet	Neininger.
D5	H. Simon, Berlin	Klemm 25 IV*a*	80-85 h.p. Genet	H. Simon.
D6	Alexander Soldenhoff, Dusseldorf	" Soldenhoff "	40 h.p. Salmson	A. Riediger.
D7	Leichtflugzeugklub München e.V.	Klemm L 25 I*a*	45-50 h.p. BMW X	von Gravenreuth.
D8	" " " "	BFW M23*b*	"	H. Böhning.
D9	Rheinische Luftfahrt-Industrie G.m.b.H., Krefeld	R.K. 29	95-115 h.p. SH 14	K. Katzenstein.
E1	Horst von Salomon, Berlin	Klemm	80 h.p. Genet	H. Benz.
E2	Junkers-Flugzeugwerk A.G., Dessau	Junkers " Junior " A.50	80-92 h.p. SH 13*a*	—
E3	Fritz Papenmeyer, Hamburg	Baumer B VI	90 h.p. Gipsy	—
E4	Wilh. Huth, Travemünde	Low-wing mono	35-40 h.p. ABC Scorpion	—
E5	Mohamed Sidki, Egypt	Klemm	40 h.p. Salmson	M. Sidki.
E6	Fr. W. Siebel, Berlin	Klemm L 26	80 h.p. SH 13*a*	Fr. W. Siebel.
E7	Alfred Friedrich, Berlin	DH Moth Special	115-125 h.p. Gipsy II	—
E8	Bayerische Flugzeugwerke A.G., Augsburg	BFW M23*c*	Argus	—
E9	" " " " "	"	"	—
F1	" " " " "	"	"	—
F2	" " " " "	"	"	—

ENGLAND

K1	Cirrus Aero Engines, Ltd., London	Avro " Avian "	104 h.p. Cirrus-Hermes	S. A. Thorn.
K2	Robinson Aircraft Co., Ltd.	" Redwing "	75 h.p. A.B.C. Hornet	—
K3	The de Havilland Aircraft Co., Ltd.	" Moth "	100 h.p. Gipsy	H. S. Broad.
K4	Spartan Aircraft, Ltd.	" Avron "	120 h.p. Gipsy II	H. J. Andrews.
K5	A. S. Butler, London	" Moth " DH 60M	100 h.p. Gipsy	A. S. Butler.
K6	The Hon. Lady Bailey	" Moth "	Gipsy	The Hon. Lady Bailey.
K7	Maxwell D. Trench	Mono Special	110 h.p. Warner	J. E. Carberry.
K8	Capt. The Rt. Hon. F. E. Guest, D.C., D.S.O.	D.H. Moth	100 h.p. Gipsy, Mark II	Miss W. E. Spooner.

FRANCE

L1	P. Mauboussin, Paris	Mauboussin	40 h.p. Salmson	—
L2	Comte de Lambilly (Belgium)	St. Hubert	110 h.p. Walter	Jaques Maus.
L3	Ludovic Arrachart	Caudron 193	95 h.p. Renault	—
L4	Aéro-Club du Royaume Yougoslave, Section de Ljubljana	Bloudek XV	Cirrus Mark II	Janko Colnar.
L5	Edouard Albert	Albert A 61	95 h.p. Salmson	Ed. Albert.
L6	Mlle. Denise Collin	Albert A 62	95 h.p. Renault	—
L7	Maurice Finat	Dewoitine	"	M. Finat.
L8	E. Dewoitine	"	100 h.p. Renault	Marcel Doret.
L9	Gustave Douchy	Douchy	40 h.p. Salmson AD 9	G. Douchy.
M1	Aéro-Club de l'Aisne	Caudron	Renault	—
M2	René Caudron	Caudron 193	95 h.p. Renault	Delmotte.
M3	Guerchais et Henriot	Guerchais-Henriot 5	"	Bapt.
M4	Jean de Permangle	Farman 220	"	Lallouette or Permangle.
M5	Club Aéronautique Universitaire	Mauboussin	40 h.p. Salmson	Ducout.
M6	René Caudron	Caudron C 232	95 h.p. Renault	—
M7	Mlle. Maryse Hilsz	Morane Saulnier Moth	95 h.p. Gipsy	Mlle. Hilsz.

POLAND

O1	Ateliers Aéronautiques d'Etat, Warszawa	P ZL 5	85-100 h.p. Gipsy	J. Gedgowd.
O2	" " " "	"	"	B. Orlinski.
O3	Komitet Wojewodzki L.O.P.P., Krakow	D.K.D.-V.	85-95 h.p. Cirrus M.III	St. Dzialowski.
O4	Aeroklub Akademicki w. Krakowie, Krakow	S.1. Monoplane	85-95 h.p. Cirrus	Dr. K. Piotrowski.
O5	Podlaska Wytwornia Samolotow Sp. Akc.	P.W.S. 8	85 h.p. Walter-Vega	P. Dudzinski.
O6	" " " "	P.W.S. 50	85 h.p. Cirrus Mark III	Z. Babinski.
O7	" " " "	P.W.S. 51	80 h.p. Genet	J. Lewoniewski.
O8	" " " "	P.W.S. 52	85 h.p. D.H. Gipsy	F. Rutkowski.
O9	Aeroklub Rzeczypospolitej Polskiej, Warszawa	R.W.D.4	105-115 h.p. Cirrus-Hermes	F. Zwirko.
P1	" " " " "	"	" "	T. Karpinski.
P2	" " " " "	"	" "	J. Bajan.
P3	" " " " "	R.W.D.2	40 h.p. Salmson AD 9	St. Plonczynski
P4	" " " " "	"	" "	E. Wieckowski.
P5	" " " " "	"	" "	J. Muslewski.

SWITZERLAND

S1	Jean Broccard et Jean-René Pierroz	Breda 15 S	110 h.p. Walter-Venus	J. R. Pierroz.
S2	Charles Kolp, St. Gallen	Klemm L 25	80 h.p. Argus As 8	Charles Kolp.
S3	Dr. Friedrich Hansen Zürich	Müller-Griesheim Hochd. GMG	Statax " S " 40 h.p.	Dr. F. Hansen.
S4	Dipl.-Ing. Hugo G. Schmid, Zürich	Korsa T2	50 h.p. Anzani	H. G. Schmid.

SPAIN

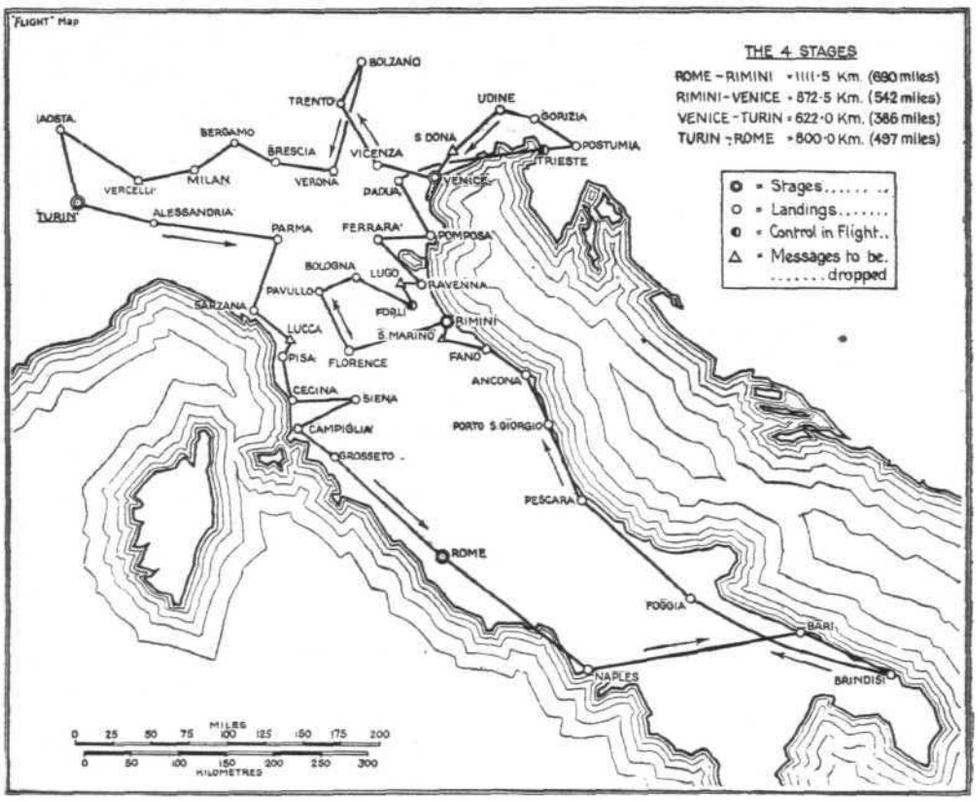
T1	Aero-Club de Espana	C.A.S.A.	Gipsy	Rodriguez.
T2	" " " "	"	"	Ordiales.
T3	M. Ogara	"	"	Haya.
T4	Elizalde S.A.	"	Elizalde	Navarro.
T5	Archduke Antonio Habsborgo Borbon	D.H.Moth	Gipsy 85 h.p.	Archduke Antonio Habsburgo Borbon.
T6	Aero-Club Andalucia	Moth	Gipsy	—
T7	Duc d'Estremera	Moth	"	Ansaldo.
T8	M. Loring	Loring	"	Rambaud.
T9	Union Aérea	Junkers	Genet	Espinosa.

CIRCUIT OF ITALY

International Competition for Light 'Planes

THIS competition, organised by the Royal Aero Club of Italy, is international, and is restricted to light planes of the first category, viz., of a maximum tare weight of 400 kg. (880 lb.) Competitors will, however, be allowed a tolerance of 20 per cent. The competition will consist of a series of demonstration tests for the purpose of determining the practical capabilities of the machines, followed by a speed test consisting of four stages.

The preliminary demonstration tests, which will take place from August 20 to August 30, at the Littorio Air Port, are intended to show the technical merits of the different machines. The results will form the basis of an aggregate classification for all competitors, the numerical value of which will be converted into a time value equivalent to 30 seconds for each point in the classification. As 60 points constitute the maximum classification the maximum start by which a competitor may benefit will be 30 minutes. The starting time of the competitors in the Circuit of Italy will therefore be governed by the handicaps derived from the classification of the practical tests, although for the purpose of computing the time taken in covering each stage, the departures of all the competitors will be regarded as having been simultaneous with the departure of the machine classified highest.



The handicap will be applied at the start of each stage.

It follows that the pilot who shall first cross the winning line at the end of each stage will be the winner for that stage, while the sum of the times taken by the different competitors in the four stages will show which pilot has taken the least time and is therefore the winner.

Prizes

Prizes to the amount of 300,000 lire will be awarded in the competition and will be distributed as follows :—To the winner in the general classfication, 100,000 lire (prize of the *Popolo d'Italia*) ; 2nd prize, 50,000 lire ; 3rd, 25,000 lire ; 4th, 12,000 lire ; 5th to 10th, inclusive, 7,600 lire ; 11th to 15th inclusive, 5,000 lire ; 16th to 20th inclusive, 3,500 lire ; 21st to 25th inclusive, 2,000 lire.

The remaining sum of 15,000 lire will be distributed, at the discretion of the Committee of Stewards, among those competitors who, after having covered the second stage, may be compelled to abandon the competition through forced landings otherwise than on the appointed landing ground, and whose machines may have suffered serious damage.

Those competitors who cover the entire course, and are not included in the list of the first 25 classified will have their entry money returned to them in full. In addition to the prizes mentioned, there will also be other prizes, which, it is expected, will certainly exceed 300,000 lire. The prizes in question, which are offered by the cities touched in the course of the flight, will be awarded in proportions yet to be fixed.

A large number of medals, *objets d'art*, etc., will also be awarded in the competition. Prizes not awarded will remain in the hands of the R.Ae.C.I.

The competition will take place entirely over Italian soil, the departure and arrival being in Rome (at the Littorio Air Port), from August 15, 1930.

Details of the Competition

(*a*) The practical tests will be carried out on August 20, 21, 22 and 23, 1930, at the Littorio Air Port (Rome). The start for the Round-Italy Flight will take place on the morning af August 25 at 5 o'clock.

The examination in respect of practical capabilities will take place at the Littorio Air Port (Rome), and will comprise :—

1. A climbing test.
2. Classification of the touring qualities of the machines (safety, equipment, convenience, etc.).
3. A taking off and landing test.

(*b*) The classification derived from the examination in respect of practical capabilities will be used to determine the starting handicap in the case of each competitor, which will be maintained at the start of each of the four stages.

(*c*) The Round Italy Flight will be carried out in four stages with obligatory landings on the grounds of the localities set forth in the following itinerary, and on the following dates :—

1st stage (1111·50 *km.*) (*August* 25, 1930).—Rome (Littorio)-Naples, Naples-Bari, Bari-Brindisi, Brindisi-Foggia, Foggia-Pescara, Pescara-Fermo, Fermo-Ancona, Ancona-Fano, Fano-S. Martino (messages to be dropped), S. Martino-Rimini.

2nd stage (872·50 *km.*) *August* 27.—Rimini-Florence, Florence-Pavullo, Pavullo-Bologna, Bologna-Predappio (control in flight), Predappio-Lugo (message to be dropped), Lugo-Ravenna, Ravenna-Ferrara, Ferrara-Pomposa, Pomposa-Padua, Padua-Trieste, Trieste-Postumia, Postumia-Gorizia, Gorizia-Udine, Udine-S. Donà di Piave (message to be dropped), S. Donà di Piave-Venice.

3rd stage (622 *km.*) *August* 29.—Venice-Vicenza, Vicenza-Trento, Trento-Bolzano, Bolzano-Verona, Verona-Brescia, Brescia-Bergamo, Bergamo-Milan, Milan-Vercelli, Vercelli-Aosta, Aosta-Mirafiori.

4th stage (800 *km.*) *August* 31.—Mirafiori-Alessandria, Alessandria-Parma, Parma-Sarzana, Sarzana-Lucca (message to be dropped), Lucca-Pisa, Pisa-Cecina, Cecina-Siena, Siena-Campiglia Marittima, Campiglia-Grosseto, Grosseto-Rome (Littorio).

Entries

Single-fee entries must reach the R.Ae.C.I. not later than 6 p.m. on the June 20, 1930, and be accompanied by an entrance fee of 1,000 lire. Double-fee entries will not be received later than 6 p.m. on August 15, and must be accompanied by a fee of 2,000 lire.

General Regulations

1. The machines competing in the Round Italy Flight must be furnished with certificates of airworthiness in accordance with the Regulations of the C.I.N.A.

2. Owners, pilots or firms may qualify as competitors.

3. A passenger on board the machine must not be less than 18 years of age. He may be changed at any stage of the flight.

4. In the case of competitors who are single-fee entrants, the time when they must appear in person at the Littorio Air Port (Rome) expires at 1 a.m. on August 18, 1930.

Practical Tests

5. The practical tests will take place on August 20, 21, 22 and 23, at the Littorio Air Port (Rome), and will comprise :—

(*a*) A climbing test.—The climbing test must be effected in 40 mins. with a useful load of 200 ks. This weight shall be regarded as including the passengers and the parachute. To complete the prescribed load, sealed lead ballast, which cannot be utilised, will be employed if necessary.

Classification in the climbing test will be effected by a graduation up to a maximum of 20 points accorded to the competitor who shall have obtained the maximum altitude. The graduation will be applied successively by deducting ½ point for each 100 metres less, as compared with the altitude obtained by the first competitor in the classification. All the machines must obtain a minimum altitude of 2,000 metres.

(*b*) A taking-off test for which a maximum of 10 points will be given.

(*c*) A landing test for which a maximum of 15 points will be given.

(*d*) An examination in respect of touring equipment with a maximum of 15 points.

Touring Equipment Examination

6. The 15 points given for touring equipment will be awarded for the following features comprehensively : (*a*) Extinguishers ; (*b*) Parachute installation and facility of launching ; (*c*) Devices to prevent stalling.

General Convenience

(*d*) Ease of access and convenience for pilots and passengers ; (*e*) Navigating and other instruments ; (*f*) Luggage arrangements ; (*g*) Visibility ; (*h*) Folding capability of wings ; (*i*) General appearance.

7. The departures on the Round Italy Flight will begin at 5 a.m. on August 25. The graduation resulting from the eliminating tests as a whole will also

give the order of departure for each competitor, the handicap principle of 30 seconds being applied to each of them for each point below the maximum contemplated by the classification. This order of departure will be maintained at the start of each stage.

For the purpose of computing the times taken on each stage the departures will be regarded as taking place simultaneously. The winner in the stage will be the competitor who shall have taken the shortest time.

8.—**Verification**

At the beginning of the test the engine crank-case, fuselage and cellule will be marked. The parts verified may not be changed during the course of the flight, otherwise the competitors will be disqualified.

9. Any complaints must be submitted by competitors to the Sports Delegates for the winning line of each stage before their departure on the subsequent stage. They must be accompanied by a fee of 250 lire.

THE "CELLON" CROSS-CHANNEL COMPETITION

(Under the Competition Rules of The Royal Aero Club.)

THE prize (£1,000, offered by Cellon, Ltd.) will be awarded to the first British pilot accomplishing a motorless flight in a glider of all-British construction from England to France (or *vice versa*), in accordance with the following conditions :—

Supplementary Regulations

DATE.—The competition will be open for a period of two years from June 1, 1930, to May 31, 1932, inclusive, unless previously won.

ORGANISATION.—The competition will be conducted by The British Gliding Association.

COMPETITORS.—The pilot of the glider must be a British subject, and hold a current "C" Glider Pilot's licence issued by The Royal Aero Club.

GLIDERS.—The competition is open to any heavier-than-air machine, entirely constructed in the British Isles, not provided with any motive power, and which is not supported either wholly or in part by any gas which is lighter than air, and which has a current Certificate of Airworthiness issued by The British Gliding Association in accordance with its regulations at the time of the attempt.

OFFICIAL OBSERVERS.—The British Gliding Association will appoint Official Observers to control all starts.

ENTRIES.—The entry fee is £5. This fee, together with entry form, must be received by The British Gliding Association, 44A, Dover Street, W.1, at least 14 clear days before any attempt is made.

STARTING PLACE.—The competitor may select his own starting place subject to the right of veto by The British Gliding Association if such point is considered dangerous or otherwise unsuitable. The competitor must obtain any necessary permission from the owner of the land as a starting place. All starts must be made during the hours of daylight. The competitor is responsible for the observer being notified beforehand of any attempts, and for his being present at the start.

LAUNCHING.—The launching shall be a normal hand launching by the usual methods, only hand traction being used, and not more than twelve persons pulling upon the tow rope or elastic.

TOWED GLIDING.—The glider shall not be towed in the attempt to cross the Channel. Any competitor who is towed otherwise than when launching, in the manner laid down in the above regulation, is automatically disqualified.

THE FLIGHT.—The British Gliding Association will issue log sheets, which must be carried by the pilot in all flights in the competition. The observer will fill up the Starting Certificate on the log sheet and hand the same to the pilot prior to the start of any flight in the competition. The pilot, on landing, must fill up the Landing Certificates on the log sheet. This certificate must contain such particulars as will enable the Association to locate the place of landing. The Landing Certificate must be signed as correct by the pilot and two responsible persons present at the time of landing, or, if none present, resident in the district where the landing was made. The landing must be made clear of the water.

SAFETY.—No attempt shall be commenced until The British Gliding Association shall have been satisfied that the pilot has taken all reasonable steps to ensure the safety of himself in the event of a descent on to the water during crossing.

The arrangements in connection with any attempt shall be made to the satisfaction of The British Gliding Association.

General Conditions

1. A competitor, by entry, thereby agrees that he is bound by the regulations herein contained or to be hereinafter issued in connection with this competition.

2. The interpretation of these regulations or of any hereafter issued shall rest entirely with The British Gliding Association.

3. The competitor shall be solely responsible to the officials for the due observance of these regulations, and shall be the person with whom the officials will deal in respect thereof, or of any other question arising out of this competition.

4. A competitor, by entering, waives any right of action against The British Gliding Association, or Cellon, Ltd., for any damages sustained by him in consequence of any act on the part of the officials of The British Gliding Association, or on the part of their representatives or servants or any fellow competitor.

5. The machine shall at all times be at the risk in all respects of the competitor who shall be deemed by entry to agree to waive all claim for injury either to himself or his passenger, or his machine, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify The British Gliding Association and Cellon, Ltd., in respect thereof.

6. The committee of The British Gliding Association reserves to itself the right to add to, amend, or omit any of these Rules should it think fit.

THE ROYAL AERO CLUB OF THE UNITED KINGDOM

OFFICIAL NOTICES TO MEMBERS

King's Cup Air Race.—Entries close on Friday, June 6, 1930. Late entries (fees £10) will be received up to noon Friday, June 13. The entries received up to May 31, 1930, were as under:—F. S. Symondson, D.H. Moth (Gipsy); I. R. Parker, D. H. Moth (Cirrus); A. G. G. Marshall, D.H. Moth (Gipsy); G. Fane, Comper "Swift" (Pobjoy); Lieut. Caspar John, R.N., Avro Avian (Cirrus); A. S. Preist, D.H. Moth (Gipsy); Derek Schreiber, D.H. Moth (Gipsy); J. B. Buckley, D.H. Moth (Cirrus).

Aerial Tour of Italy, 1930.—The Aerial Tour of Italy, organised by the Royal Aero Club of Italy, takes place on August 15-31, 1930. (*See* page 605.) The prizes amount to 300,000 lire. Entries close June 30, 1930. Entry forms may be obtained from the Royal Aero Club, 3, Clifford Street, London, W.1.

Northampton Air Pageant.—Light Aeroplane Clubs and private owners are reminded of the Northamptonshire Aero Club's Pageant which takes place at Sywell Aerodrome, Northampton, on Monday next, the 9th instant. Intending visitors by air are requested to communicate with Mr. G. Linnell, Sywell Aerodrome, Northampton.

London Aeroplane Club.—In spite of the unsatisfactory weather during May the flying time of the club broke all previous records; the figures being 436 hrs. 20 mins. Eight members qualified for their "A" licences during the month.

Offices: THE ROYAL AERO CLUB
3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary

MISS AMY JOHNSON HONOURED

HAVING successfully accomplished her remarkable flight from England to Australia in 19½ days—which was fully reported in last week's issue of FLIGHT—Miss Amy Johnson is the centre of a whirlpool of enthusiasm and admiration, which the aviation world has not experienced since Bert Hinkler's similar exploit, or Charles Lindbergh's lone flight across the Atlantic.

Ever since she landed in Australia there has been a flow of congratulations and honours—foremost amongst which being the announcement that H.M. the King has been pleased to confer upon Miss Johnson the Order of C.B.E. Her recognition in the King's Birthday Honours' List is undoubtedly well deserved and has met with popular favour.

Always to the fore in matters connected with aeronautics, *The Daily Mail* has given £10,000 to Miss Amy Johnson in recognition of her magnificent flight, and in addition, has bought her machine, *Jason Wanderer*, and arranged, on her return to England, for her to make a tour of the British Isles with her machine. Incidentally also, Miss Johnson will write regularly, in *The Daily Mail*, articles on current aviation topics.

A further tribute by the Press was the happy plan of *The Daily Sketch* and *Evening Standard* to open a "Shilling" Fund, with 2,000 shillings for a start, with the object of buying a new machine for Miss Johnson. Already the scheme has met with an enthusiastic response, especially from women—1,000 shillings being sent amongst the first donations in the joint names of Viscountess Elibank, Lady Iris Capell, Lady Bowden, and the Hon. Mrs. Victor Bruce, on behalf of the Women's Automobile and Sports Association.

The Penalty of Fame

As stated previously, numerous messages of congratulation, tributes and honours have been bestowed upon Miss Johnson; last week we referred to a few of these, and below we give a few more.

On behalf of the Guild of Air Pilots, Sir Sefton Brancker sent the following cable to Miss Johnson:—

"As Master of the Guild of Air Pilots and Air Navigators of the British Empire, I have the honour to welcome you to Honorary Membership of this Guild. Kindly reply acceptance."—Sefton Brancker. To which the following reply was received, on June 2:—"Proudly appreciate the honour conferred upon me, which is one of my life's ambitions.—Amy."

Miss Johnson is the first woman member of this Guild, either honorary or otherwise.

The Council of the Society of Engineers has elected Miss Johnson an honorary fellow of the society—there being only one other woman in this society, an associate member.

Lord Inchcape (chairman of the P. and O. Line) has cabled to the Sydney agents instructing them to offer Miss Johnson a free first-class passage home to England and free transport for her aeroplane if she so desires.

Here are some more congratulations and views concerning the flight:—M. Laurent Eynac, the French Air Minister, sent the following telegram to Lord Thomson, Secretary of State for Air:—"Please convey to Miss Johnson the expression of the profound admiration with which the whole of the French Air Service views the feat which she has just accomplished and to which I wish to add the heartiest personal greetings."

Sir Thomas Polson, Chief Organiser of the United Empire Party (of which Miss Johnson is a member): Fellow-members of the United Empire Party join in sincere congratulations and heartfelt thankfulness for your wonderful achievement recorded on Empire Day.

Sir Alan Cobham: Congratulations magnificent effort. Heartfelt appreciation added prestige you have given British people. Give my love to Australia. They will give you greatest welcome in world.

Mr. Scullin, the Prime Minister of Australia: Heartiest congratulations on your wonderful achievement, which has won the admiration of the whole world. On behalf of the Commonwealth Government I desire to extend to you a cordial welcome to Canberra while Parliament is in session. We sincerely hope you will be able to arrange this visit. Best wishes.

Col. The Master of Sempill, President of the Royal Aeronautical Society: The Royal Aeronautical Society, fully realising the inadequacy of words on this occasion, send you most cordial felicitations on the completion of your plucky flight. Your splendid and complete triumph over the many serious difficulties mainly provided by Nature has not only earned in full our most sincere admiration, but has given another convincing demonstration of the remarkable qualities of our light aeroplanes and engines that will redound widely to the credit of British aviation.

The Duchess of Bedford: I am delighted. Miss Johnson's success is a record women will be proud of, as it has been attained by careful training and great pluck and perseverance against great odds.

Lady Bailey: It is a wonderful example of courage and enterprise which, I am sure, will be followed by many others. It is also a fine example of what the flying clubs have done.

Miss Winifred Spooner: I think she has made one of the most marvellous flights I remember. She has put up a wonderful show, and I cordially congratulate her. It cannot have been other than a tremendous strain on her.

Sir Verdon Roe: Her achievement shows that if a girl with the little flying experience that she has had can do that, we may expect very wonderful things in the future.

The Kumintang Society, on behalf of the Chinese of Australia, presented Miss Johnson with the following illuminated address: We rejoice that we are privileged to offer congratulations to the world's greatest air-woman after what is considered by experts one of the most wonderful feats accomplished by a human being. We are pleased for another reason: the incident proves that there is a great force in this world like a new power-house whose Star in the East is daily becoming brighter. . . . Now we can see that given equal opportunity we can look to women to provide not only brain power, but heroism and gallantry as instanced in the present remarkable flight surpassing anything of the kind recorded by either sex in the history of the world. Your act of gallantry will cause a higher plane of thought throughout the world, and will much enrich the history of your great country.

In Australia

On May 26, Miss Johnson, after what she described as a welcome beyond her comprehension that overwhelmed her, left Port Darwin, with an aerial escort, on her journey south to Sydney. Landing at Daly Waters to refuel, she continued and reached Alexandra Station, 600 miles from Port Darwin. The next day she flew to Cloncurry, and after lunch proceeded to Longreach. Here an enormous crowd gave her an enthusiastic and wild welcome.

Continuing the next day, May 28, Miss Johnson intended to fly to Roma, but she lost sight of her escort *en route* and flew too far west, having eventually to land at Quilpie, about 130 miles from Charleville. After refuelling, she started off again and followed the railway to Charleville, when she arrived after dusk. Miss Johnson made a safe landing with the help of beams of light thrown across the aerodrome from the headlamps of several motor cars. On landing, she made a brief speech (which was broadcast throughout Australia), saying:—"I'm tired and I'm going to bed. All I intend to say is 'Hullo, Australia.' I will talk again at fuller length to-morrow from Brisbane."

Having spent the night at Charleville, Miss Johnson continued her flight next day. She flew to Toowoomba where she landed for lunch, and where a huge crowd greeted her, afterwards flying on to Brisbane. It was here she met with her first serious crash, for in landing she overshot the aerodrome and struck a fence. The machine crashed and turned over, to the horror of the crowd of some 8,000 people on the 'drome. There was a rush to her assistance, but she was seen to climb out of the wreckage, unhurt. "I'm sorry to land like this," she said, "my poor old 'bus!"

However, she was escorted through the cheering crowd, and was greeted by Sir John Goodwin, Governor of Queensland, and others, then proceeded to the City Hall where a civic reception was held. During the following days a number of functions were arranged in her honour, but meanwhile the strain—not only of her flight from England, but her crash and numerous Australian receptions—was telling on her. She was, therefore, ordered by her doctor to rest as much as possible, but she, nevertheless, carried out many of her engagements, including an early morning broadcast over the new wireless telephone to the Mother Country, last Wednesday.

The *Jason Wanderer* was repaired by Q.A.N.T.A.S. and it was arranged that Miss Johnson was not to fly it solo to Sydney, but to proceed as passenger in an Australian National Airways' 'plane piloted by Mr. Ulm. This was carried out on June 4, over 75,000 people greeting Miss Johnson on her arrival at Sydney.

AIRISMS FROM THE FOUR WINDS

Progress of the "Graf Zeppelin"

As recorded in our last issue the German airship *Graf Zeppelin* returned from Rio de Janeiro to Pernambuco on Monday, May 26. She remained at the temporary mooring mast until Wednesday, the 28th, when she started at 11 a.m. for New York. Between Bermuda and New York the airship ran into the worst storm which Dr. Eckener had ever encountered in the air. Two struts of the rear engine car were damaged in the gale. The ship, however, weathered the storm successfully, which proves, in Dr. Eckener's opinion, that Zeppelin airships can outride any weather. The *Graf Zeppelin* arrived at Lakehurst airship station, New Jersey, at 7.35 a.m., on Saturday, May 31. The "Los Angeles" was leaving the station at the time. Very few spectators were present to see the arrival of the German airship. The ship was first moored to a mast, but afterwards had to be put in a hangar for repairs to the struts. While in charge of the landing party she suddenly rose and lifted 15 marines into the air. They dropped to the ground, and one was seriously injured. On Tuesday, June 3, the *Graf Zeppelin* left Lakehurst at 10.12 p.m. and flew low over the skyscrapers of New York, bound for Friedrichshafen. She had on board 22 passengers, including Sir Hubert and Lady Wilkins, as well as 52,000 pieces of mail. A motor-car is included in the cargo.

H.H. The Aga Khan's New Prize

Now that the Aga Khan prize for the first solo flight by an Indian between India and England has been won by Mr. Aspy Engineer, His Highness the Aga Khan has offered another prize of £500 for the first Indian to fly from India to Capetown within four weeks. This is an unusual route and should produce an interesting competition.

Parish Visiting in Australia

PARISHES in parts of Australia are so extensive that the clergy find it a matter of difficulty to visit all their parishioners in the year. One incumbent, the Rev. L. Daniels, of Wilcannia, New South Wales, realised that an aeroplane was just what he wanted, so he put an advertisement in the *Morning Post*. Lord Wakefield saw it, and with his usual generosity presented the clergyman with the price of an aeroplane. Things in general, and a propeller in particular, will now begin to hum in the parish of Wilcannia.

The Nairobi New Aerodrome

WE have heard from a correspondent that during the rainy season the new aerodrome at Nairobi, which is 1,500 yards long, is waterlogged for some four to six weeks. It is proposed to make a runway of a sort of hard earth called murram, which resists wet, and is generally used for making roads in East Africa. This will probably be an expensive matter, though probably less costly than raising the whole level of Juhu aerodrome outside Bombay, which is being undertaken by the Government of India.

Bernardi's Escape

MAJ. MARIO DI BERNARDI, who won the Schneider Trophy in 1926 at Hampton Roads, was involved in an air collision near Rome on May 28. Bernardi jumped with his parachute and came safely to earth, but the other pilot, named Lovadina, was killed.

Winnipeg Air Port

THE Federal aviation authorities have approved of the site recommended for the Winnipeg Air Port, development of which will cost about $500,000. Two investigating groups, one in Great Britain and one in the United States, have already referred to Winnipeg as being in a most favourable geographical position to be on the line of air navigation to the Orient.

Sqdn.-Ldr. A. S. C. S. Maclaren, M.C.

THE retirement, on account of ill-health, is announced of Sqdn.-Ldr. Archibald Maclaren, M.C. It will be remembered that in 1924, Sqdn.-Ldr. Maclaren, accompanied by F.O. (now Flight-Lieut.) W. N. Plenderleith and Sergt. Andrews, started from Calshot in a Vickers "Vulture" amphibian on an attempt to fly round the world. He crashed his first machine on the Malay Peninsula, but an American destroyer conveyed his second machine to him from Japan. This machine finally came to grief in fog near Petropavlovsk, in Kamchatka, before starting to cross the Behring sea.

Air Mail Postal Regulations

THE Civil Aviation Section of the London Chamber of Commerce have recently had under consideration the various and complex questions affecting air mail postal regulations. It is felt that greater use would be made of air mail facilities if a uniform rate of surcharge for air mail letters could be introduced in place of the present dual system of postage and air fee, and also if there were some re-arrangement of the method of dealing with insufficiently stamped letters. The heavy charges made by foreign postal administrations are also a serious obstacle to be overcome. There is no doubt that every effort should be made to get some alteration in the rules of the International Convention on these questions. The Civil Aviation section are approaching the International

MAKING THE BEST OF IT! A lull in the rain at Bristol allowed natural spirits to enliven the party! Left to right: Commdr. Perrin, Mr. R. G. Cazalet, Capt. Broad (seated), Flt.-Lt. Bruce, Sqd.-Ldr. England, Mr. St. J. Plevins (John Hall & Sons), Mrs. Plevins, Mr. Handley Page, Col. Outram (D.A.I.), Major Bishop (A.I.D.), and on the extreme right is Mr. G. Parnall. (FLIGHT *Photo.*)

Chamber of Commerce, and have suggested that the following points might receive special consideration by the air committee of that Chamber :—

(1) That the public should be charged for the use of the air mail on a flat-rate basis for a letter of unit weight instead of, as at present, a surcharge per unit of weight plus ordinary postage based on some other unit of weight.

(2) That postal administrations should not make a profit out of their public by reason of the use of the air mail in excess of the profit normally made for mail not carried by air.

(3) The minimum surcharge for air mail letters should be on a uniform basis for all countries in the International Postal Union.

(4) That to avoid the possibilities of delay, air companies should be allowed, when unable through *force majeure* to continue a flight, to retain the mails and forward them by the quickest possible alternative means of transport to the next place at which they can continue their journey by air. Without special permission this arrangement is not allowed, and sometimes the lack of this facility results in serious delay.

(5) That arrangements should be made for understamped air letters to be forwarded by the air mail instead of being sent on by the surface route, as at present ; the difference only being charged, and not twice the difference, as is the custom in respect of other understamped letters.

(6) It would be a great advantage if the use of special air mail stamps could be discontinued, and if some conventional sign were adopted by all countries to indicate air mail. For example, registered letters have the conventional blue cross ; air mail letters might have a conventional red diagonal cross, or something of the same nature, and thus clearly differentiate to all administrations the air mail from the ordinary mail.

The Prince of Wales Visits Westlands

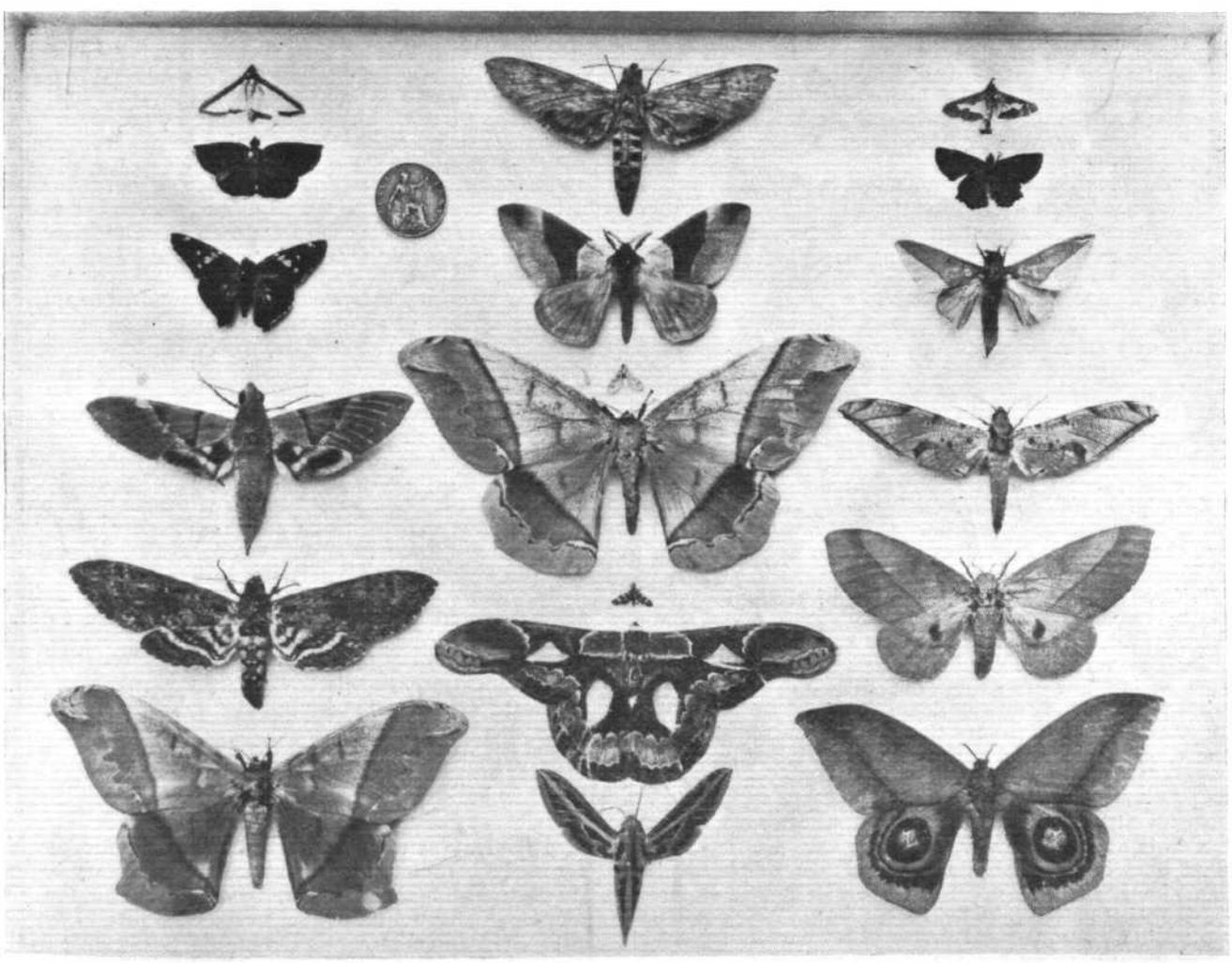
On May 30 H.R.H. the Prince of Wales arrived unexpectedly at the Westland Aircraft Works, Yeovil, on his way back to London from Torquay. He was flying in his private Moth with Sqdn.-Ldr. Don, and accompanied by Admiral Sir Lionel Halsey piloted by Flight-Lieut. Fielden. Owing to his hour of arrival the actual works were closed, but he was welcomed by Mr. R. A. Bruce, Managing Director, and by Flight-Lieut. Paget and Mr. Byron. He inspected the "Westland Wessex," and sat in the pilot's seat, and expressed his appreciation of the accommodation provided, both from the pilot's and passengers' point of view. He was thereafter entertained to an impromptu tea by Mr. Bruce, and was much interested in the photographs and models of Westland aircraft in Mr. Bruce's office. At five minutes to seven the Prince and his party took off again for Hendon, after having filled up with fuel.

London-Berlin Night Air Mail

A NEW night air mail service between London and Berlin was introduced on May 15 last. The latest time of posting at the General Post Office, London, for this service is 3 p.m., and the mail should reach Cologne and Hanover in time for the first delivery, and Berlin in time for the second delivery, the next morning. The latest time of posting in the provinces should be ascertained locally. The mail will not be dispatched on Sundays. All classes of postal packets (except parcels) may be sent ; and registration, but not insurance, is admitted. The usual air fee of 2*d*. per ounce must be prepaid, in addition to ordinary postage. Letters should bear the blue air mail label in the top left-hand corner, and may be posted in the ordinary way.

Lorraine Engines in England

MR. J. BILEFIELD, of 37, Albemarle Street, London, W.1, has been appointed agent for Lorraine aero-engines in this country. This range of engines enbraces a considerable number of types, ranging from a 100 h.p. 5-cylinder air-cooled radial to 700 h.p. 18-cylinder broad-arrow water-cooled engine, including the well-known 450 h.p. water-cooled engine, which has been fitted to the Supermarine "Southampton," the Fairey III F., and many French long-distance machines.



AN APPROPRIATE GIFT: We reproduce above a photograph of a case of moths recently presented by Mr. Alexander Duckham to Capt. de Havilland as an appropriate tribute to the latter's services to aviation. The moths were collected by Mr. Duckham on his oilfields in Trinidad. Entomology has for many years past been one of Capt. de Havilland's hobbies.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

SLOW-LANDING AIRCRAFT

[2313] May I have the honour of expressing my views in what I consider the most important weekly paper in this country which deals in flying? My subject is the development of the small private aeroplane and the lines on which it is at present being conducted.

Private flying is admittedly gaining in popularity, but is it gaining by leaps and bounds as it ought? An article occasionally appears in the daily Press which would lead the man in the street to believe that by this time next year the sky, if not black, will, at any rate, be considerably darkened by one, two, and four-seater "flyabouts." The next day his breakfast is spoilt by a highly coloured account of Mr. So and-So's "narrow escape from death," and a photo of Mr. So and-So's once spick and span light 'plane reposing in Mr. A. N. Other's back garden and trying to look like a rubbish-heap—and succeeding admirably. The net result is that our poor Mr. So and-So, who the day before was becoming quite converted to the safety, comfort, etc., of the modern light 'plane, comes back to earth with a bump (metaphorically, of course) and, having once more become a ground enthusiast, decides to remain one, and goes off in his 10-h.p. Horace as usual.

Now, why? which? when? what? where? "What's this all about?" I can hear people saying if—when they read this.

Let's examine the facts of the case.

Here in Great Britain we have a small band of designers second to none, and the development of the light 'plane all over the world is, I think, due to them and them alone. Then come our light aero-engine designers, and they also are second to none; and I maintain it is to them, and *not* to the aeroplane designers, that the light 'plane has gained the number of adherents it has, and my reasons for saying so I will now try and explain.

Take Tom, Dick, and Harry.

Tom is a really expert pilot and no mean mechanic either. He would fly any aeroplane rather than none at all, and he can look after himself and his 'plane and engine, bring off umpteen forced landings with complete success, and so on *ad lib.* In other words, his name is *not* Legion, as he will be "there" in any case.

Dick is a really good pilot too, and the present type of light 'plane suits him admirably till something better turns up. He, like Tom, keeps his machine probably at the Blankshire Aero Club, where he can get whatever "service" he requires. *His* name is not Legion either.

Now we come to Harry.

Harry, alias Legion, thinks he would "like to fly." Perhaps he learns on a school machine, and perhaps he becomes "all right in the air" but he hasn't the time-inclination-gift to become a really first-class pilot, and, like a sensible man, he knows his limitations and doesn't go in for extended flights, doesn't care for the idea of forced landings, doesn't want to bother too much with his engine—rigging mysteries bore him; in fact, he remains a *very* "occasional" pilot indeed. *The light 'plane industry doesn't benefit by him hardly at all.* A pal of his—perhaps a *little* less adventurous, but equal in every other respect—doesn't even learn to fly; he sticks to his "Horace," and that's that!

I believe this deplorable state of affairs can be altered. I repeat: the engine designers have done and are doing their full share. Dick and Harry wouldn't dream of flying at all only for the very wonderful standard of reliability of the modern engine, but even these *sometimes* go phut, and poor Harry, our not-too-expert, doesn't bring off his forced landing, and his pal is more than ever determined to stick on the Great West Road! Catch him letting himself in for landing a beastly aeroplane in the open country with a conked engine at 40 m.p.h.!—and I'm afraid I don't really blame him either; he wasn't built that way and doesn't cotton to it at all, and why should he?

What does the designer do to help? He advertises that his machine is the only one to win the Mugwump-on-Sea to Little Crabbottom light 'plane race, Class XYZ, three times in succession. Another advertises his machine's cruising speed is 98 m.p.h., and the other advertises that you can fold the wings in 1 min. 32·616 sec.

"What the . . . is the use of all that?" says Harry's pal, "when I see his machine all smashed up. No sir, it's my 'Horace' and the Great West Road for me."

By all means let our designers cater for Tom, the expert who wants to race and stunt and can put his bus down on a sixpence, but for heaven's sake let them cater for Dick and Harry and even Harry's pal! Let them turn out a "Safety first" bus rather than a "Get you there first" bus. Let them sacrifice its performance in the air, so that D., H., and H.'s pal cannot get there against a fairly strong wind or go up when it is very bumpy; let them design a bus that they *will* go up in in fine weather, and not remain on the ground in their 10 h.p. Horace.

Landing speed, 20 m.p.h. or even less.
"Stay-put" wings—no stick and wire, please!
Rod and lever controls.
Wide undercarriage.
Self-starter.

Let them build a machine under those lines, and I think it can safely be said our number of private light aeroplane owners would soon mount up in a very astonishing manner.

Carlton Club, TERENCE LANGRISHE, ex R.A.F.
London, S.W.1.
May 23, 1930.

P.S.—Since writing, this week's FLIGHT has arrived, and, by a happy coincidence, my views are, in the main, upheld by the report of Capt. Neville Stack's views, and also by the description of DW.2.

Good luck to DW.2! T. H. L.

GLIDING

[2314] I note in letter No. 2311 a reference by Mr. J. H. Payne to "pilot power" applied to gliders.

The average man can develop $\frac{1}{8}$-b.h.p. for short periods, but it is difficult to see how this can be of any help in maintaining flight.

There is, however, the possibility of producing an aircraft which shall be something between the glider and the lightest of light aeroplanes, and this I will call the electric sailplane. A single seater machine, the size and wing area would approximate to that of a passenger carrying sailplane. The weight of the passenger would be replaced by a compact and specially designed battery, motor generator and propeller (pusher or tractor), which can readily be produced to supply enough power to enable the machine to rise from the ground and even climb for short periods. Once in the air, however, the motor would be switched off and the craft operated as a sailplane, the results depending largely upon the skill of the pilot. The suitable air currents used to gain height are also arranged to provide power to recharge the battery thus the craft would *actually take its power from the air.* Although its speed and performance would naturally be limited, the motor can be switched on at any time and the plane flown for short periods as a power driven aircraft. The motor is designed to take a considerable overload while rising from the ground. A skilful pilot could remain aloft for a long time on this machine and even make cross-country flights, his expenses being almost nil.

The power-weight ratio must not be considered in this machine. For power driven aircraft of normal type and performance electric propulsion is of course quite out of the question, but the electric sailplane is another matter. It is a new type of aircraft, the motorcycle of the air, costing little to build and practically nothing to fly.

The motor and propeller of this machine is instantly reversible and provides a powerful air brake to stop the plane after landing.

If Mr. Payne would like to have further particulars of the patent covering this electric aircraft perhaps he will communicate with me. RALPH L. ASPDEN.

London Aero Club,
Stag Lane.
June 2, 1930.

FUSELAGE MODELS

[2315] I agree with Mr. Camm about the fuselage formula for model aeroplanes. It does seem unnecessary to limit the proportions of the fuselage, when otherwise the machine makes no pretence of looking in the least like a full-size aeroplane. On the other hand, I see no reason to abolish fuselages altogether. After all, they are interesting to design, and they have certain advantages over the spar; for example, you can use more skeins, and have them longer than the fuselage.

W. E. HICK (T.M.A.C.)

Tynemouth.
May 23, 1930.

AIR TRANSPORT

SPERRY LIGHTING EQUIPMENT FOR AERODROMES AND AIR ROUTES

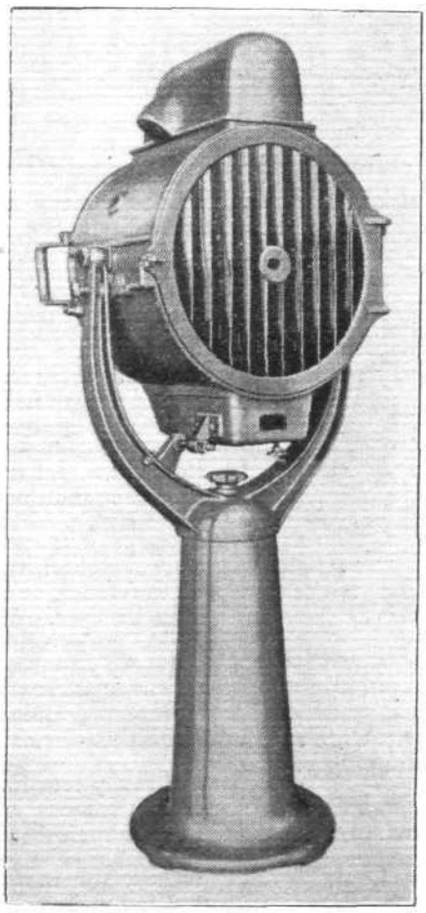
THE modern aerodrome must be something more than a mere field, that is to say, it must be equipped so that it is usable by day or by night. With a well-developed air-transport service, half the value of the aerodrome and the associated air routes lies in night traffic. The speed factor, which is the basis upon which commercial aviation is founded, has its biggest advantage in being able to double the range of inter-communication between the *end* of one working day and the *beginning* of the next. Accordingly, the routes must be lit by beacons, and the aerodrome must have floodlights, marker lights, etc., to ensure the highest degree of safety.

For instance, the Sperry Gyroscope Co., Ltd., have recently supplied nineteen revolving beacons to West Australian Airways, Ltd., for installation at various points along the new air route between Perth and Adelaide, while in America, Sperry beacons have been in the service of the air mail for the past five years, and one hundred and fifty of these were installed on Department of Commerce Air Routes during 1926 and 1927.

Aerodrome Floodlight Units

The ideal floodlight should obviously be economical in first cost and operating cost, and efficient as a lighting unit. It must, in addition, be adaptable to as many uses as possible to suit the various conditions which arise when making night landings. The Sperry 18-in. high intensity projector, fitted with a 80-deg. spread lens over the front door, fulfils these conditions. Its cost is reasonable, and where two or three units may ultimately be required to illuminate the entire ground, the units may be purchased singly as appropriations become available.

The projected beam of one of these units is 25,000,000 candle power, and when spread through the precision-ground glass front door, forms a fan of light that covers approximately 50 acres, giving 1,000,000 candle power over the field. Two of these units, overlapped, give 140-deg. spread, and three units give the full 180-deg.



The Sperry Airport Floodlight Unit will light an area of 50 acres.

The arc consumes 55 amperes at 55 volts at the lamp, and with a 100-volt motor generator and the use of the rheostat supplied, only 5,500 watts per unit is consumed, or a total of 11 kw. for two lights, and 16½ kw. for three lights.

For use on very large aerodromes the Sperry Company produces a very powerful, high-intensity floodlight, using a 1,000 mm. dioptric lens. This is of 4,000,000 candle power (electric arc) and consumes 150 amp. at 110 volts.

While these units are primarily for floodlighting, they have two very important auxiliary uses. Within a few seconds, the spread lens door of any of the units can be folded back and the projector locked into an angle of 45 deg., forming a high-powered ceiling light. The knowledge of the height of the ceiling thus indicated is most important to aviators.

In this position, the projector may also be used as a high-powered, hand-operated, emergency beacon. For example, if there are low hanging clouds or a slight haze and a 'plane is expected, the 25,000,000 candle power beam of one of these units can be flashed into the sky, producing a halo of light that may help the aviator to find the field.

Air Route Beacons

The basis of the Sperry aerial beacon is a high-power incandescent electric lamp arranged in a cast drum and provided with a 24-in. high grade parabolic mirror. The projector drum is carried in trunnion arms from a base in which is fitted an electric motor by means of which the beam from the projector is caused to revolve continuously, if desired.

The drum consists of a single casting, the mirror dome and drum sides being cast in one piece, giving the desirable combination of light weight and maximum strength and protection to the optical system, combined with a very neat appearance. The reflector used in this beacon is a high-grade silvered glass parabolic mirror. The drum is supported in a trunnion arm of a one-piece casting.

The front door glass in one type of beacon may consist of a solid convex dome of pyrex glass, by means of which 10 per cent. of the beam is reflected upwards through an angle from the horizontal up to 25 deg. The drum itself can be slightly tilted and locked so as to elevate the main beam. The upwardly dispersed subsidiary illumination is of considerable advantage to the pilot in cases where he passes through the main beam, as he can then still see the upward reflected light.

The trunnion arms are of aluminium alloy and are cast in one piece, thus ensuring a rigid support for the drum. The apron of the trunnion arms is of small diameter which permits of easier breaking of ice formation that may form between the apron and base during the day when the beacon is not in operation. The lower half of a degree sector is mounted in the centre of the trunnion arms and is coupled to the upper half of a sector which is mounted on the under side of the drum and connected together by a bolt. This permits of accurately setting the beacon to the proper elevation without the use of a spirit level or by guess work.

The base, which is stationary, consists of a one-piece aluminium alloy casting with a door for access to the motor inside. The base contains a motor, worm gear, slip rings, brush holder and terminals, and houses the upper and lower ball bearings in which the vertical shaft of the trunnion arms is carried. A slip clutch is provided to protect the motor and gear.

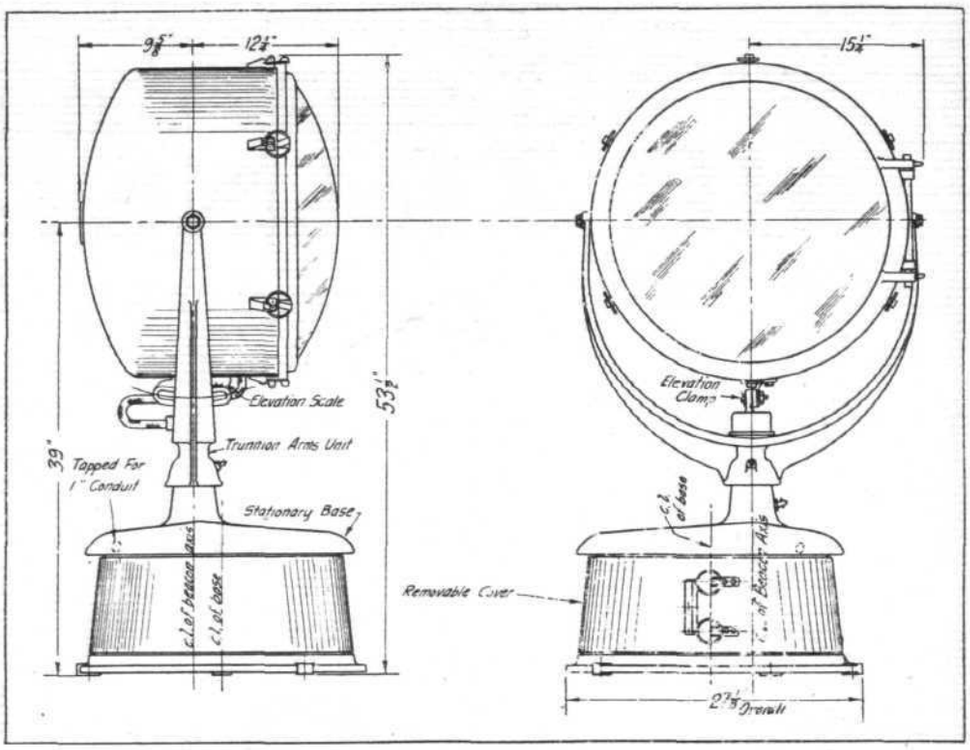
The standard lamp used is a 1,000-watt incandescent lamp, rated at 500 hours' life. These lamps can be supplied to suit various supply voltages.

The beam candle power of the 24-in. beacon with a 110-volt lamp and with a plain glass front is 3,000,000. With a prismatic dome front the candle power is 2,500,000.

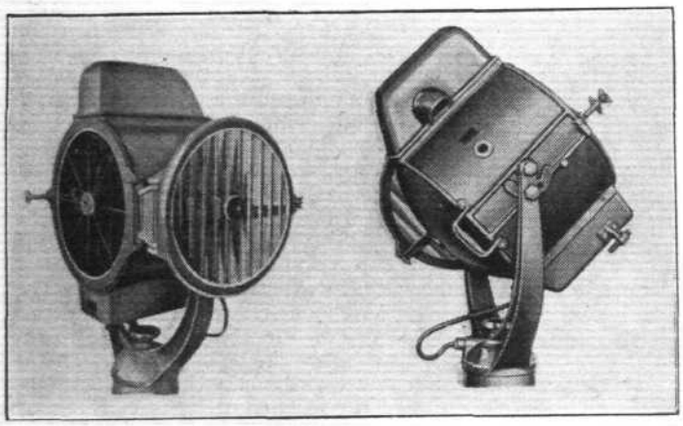
An automatic lamp changer may be provided with the beacon if desired. Two lamps are mounted in each drum. Each lamp is focused in sockets by means of a triple screw adjustment. Both lamps can be focused in a few minutes

during the day time without burning the lamps. Two sockets are carried on a pivoted platform, the platform having two normal positions. Position No. 1, held by a latch, is so arranged that the filament of the service lamp is at the focus of the reflector. Releasing the latch allows the platform to tilt from position No. 1, service lamp position; to position No. 2, the spare lamp position. When lamp No. 1 is in focus of the reflector, it alone is in circuit. When this lamp burns out, the thermostat automatically trips the latch, causing the platform to tilt to position No. 2. This brings the spare lamp in the focus of the reflector and at the same time closes the circuit supplying current to the spare lamp. Ordinarily, the beacon is designed to make six revolutions in azimuth per minute. Both the high intensity floodlights and the aerial beacon weigh approximately 175 lb.

Apart from the use of the high intensity 18-in. searchlight for floodlighting the landing ground, it can, of course, be utilized as an auxiliary beacon at the aerodrome during fog or haze, since



Dimensional Drawings of the Sperry 24-in. Airport Beacon. The net weight is 175 lb. and the gross weight 375 lb.



Two other uses of the Sperry Floodlight Unit: On the left the unit is used as an emergency beacon. The spread lens may be hinged back in a few seconds to permit the 30,000,000 candle-power beam to be used as a high-power emergency beacon in hazy or rainy weather. On the right the unit is seen tilted upward and locked in that position for obtaining the height of the "ceiling."

the spread lens front can be hinged back and projector tilted to any desired angle.

Ceiling Projectors

Other Sperry auxiliary equipment for aerodromes comprises ceiling projectors and marker projectors.

It is necessary to have a ceiling projector at every airport in order to determine the height of the clouds or ceiling above the field. Either 12-in., 18-in., or 24-in. projectors may be used, the candle powers being 500,000, 1,500,000 and 3,000,000, respectively. The projector may be permanently fixed at an angle of 45-deg. in order that the ceiling may be obtained by pacing off the distance underneath the spot of light on the clouds, or 67½-deg. in order that the ceiling sight finder may be used. 500-watt 110-volt lamps are used with the 12-in. projector, and 1,000-watt, 110-volt lamps are used with the 18-in. and 24-in. projectors, and they can be used on either alternating-current or direct-current.

Weights, 12-in., 30 lb net; 18-in., 60 lb. net; 24-in., 105 lb. net.

Marker Projectors

Twenty-four-in. incandescent projectors, somewhat similar to the beacons referred to above may be employed as fixed markers pointing in the direction of the nearest aerodrome. These consist of the same cast aluminium drum and 24-in. mirror, and the automatic lamp changer may be employed, but the mounting consists merely of the trunnion arms and a fixed socket to retain the latter. The projector may be elevated or trained to any direction. Its weight is about 105 lb.

A BRITISH ARCTIC AIR ROUTE

IN *The Times* of June 4 there appeared an announcement concerning a survey of a possible air route between England and Canada, to be laid, if found feasible, *via* Faroe Islands, Iceland, Greenland and Baffin Land. In view of the importance of the project we give below the full text of the announcement, with full acknowledgment to *The Times*. It will be seen that, before such an air route could be established, it would be necessary to reach an agreement with the Danish and Icelandic Governments, but in view of the benefits to be derived, this should present no great difficulty.—ED.

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Under the auspices of the Royal Geographical Society, and by the interest of various Government Departments in England, a committee has equipped a party of explorers to survey the route over the Faroe Islands, Iceland and Greenland. The British Arctic Air Route Expedition will sail in Shackleton's ship the *Quest*, which has been chartered from its Norwegian owners. It will be equipped for a thorough meteorological and geographical survey of the centre of Greenland, with the assistance of aeroplanes, fast motor-boats, and dog teams for reconnaissance. All news and dispatches from the Expedition, together with air views and photographs, will be published exclusively in *The Times*.

When the route has been surveyed, an experimental flight will be made over the whole of it from England to Canada and back. Apart from its shortness, another great factor in favour of this means of crossing the Atlantic by air is that the longest stretch of sea flying that need be involved

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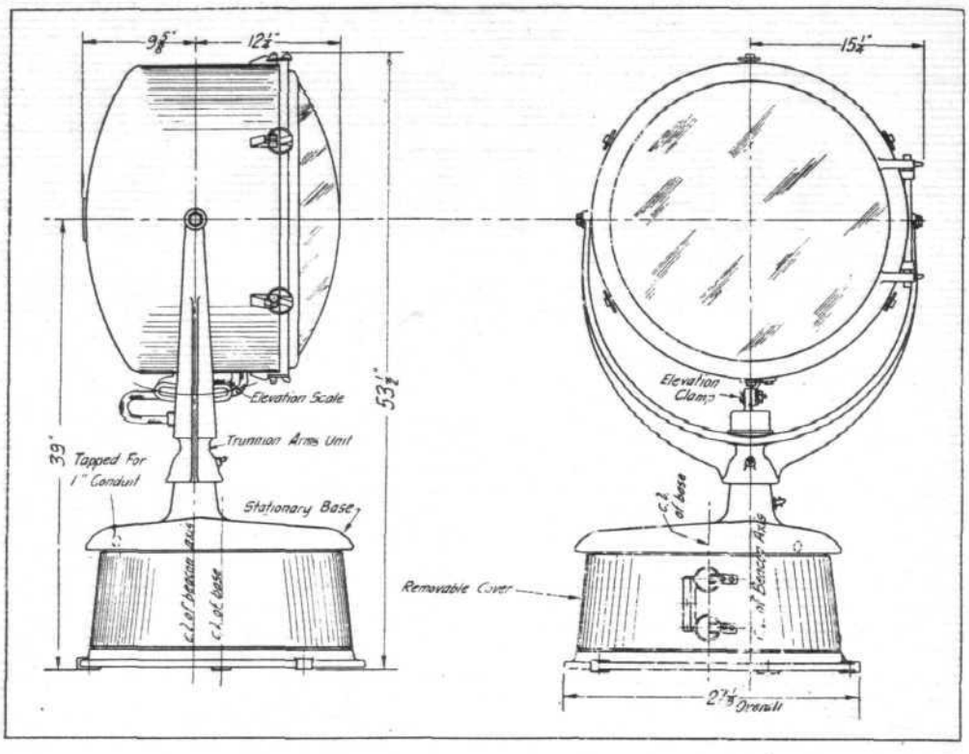

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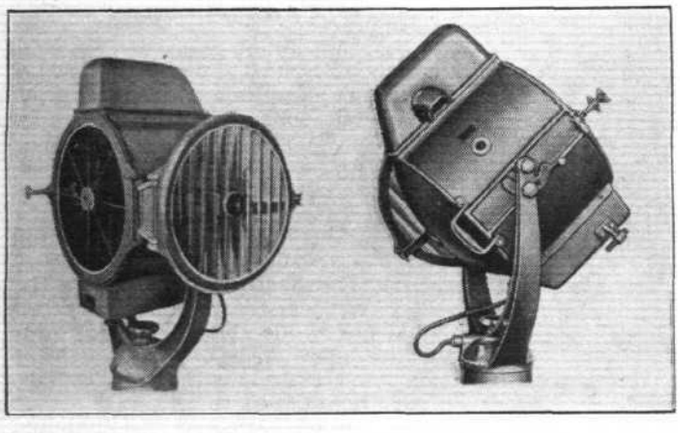

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is only 300 miles. For more than four-fifths of the way there are natural emergency landing grounds, and a system of petrol dumps will be carefully organized. The meteorological conditions of the Faroe Islands and of Iceland are well known, and the flying conditions have also been investigated, but Greenland is comparatively unexplored. The whole of the centre of Greenland is a vast ice plateau, about 500 miles across (on a line between Iceland and Baffin Land), and rising to 8,000 ft. above sea level. This plateau has only been crossed twice anywhere near its centre, and all crossings have been made in summer.

A YEAR ON THE ICE

The Expedition will establish a base camp on the south-eastern coast and a station on the top of the ice cap. Meteorologists will stay on the ice cap for a whole year. No one has ever before spent a winter at such an altitude in the Arctic. From this central base, expeditions will set out in dog sledges to make journeys into the far north of Greenland and down to the south and to the coast. The coastal base camp will be near the Eskimo island settlement of Angmagsalik, about 40 miles inshore. The central base will be about 150 miles inland on the highest part of the plateau.

The Expedition will be led by Mr. H. G. Watkins, and will number 14 in all, most of whom are surveyors. Their names are :—A. Courtauld, explorer and surveyor; J. M. Scott, surveyor and dog driver; Flt.-Lieut. N. H. D'Aeth, pilot and meteorologist; Capt. P. Lemon, wireless operator; L. R. Wager, geologist; A. Stephenson, chief surveyor; J. Rymill, surveyor; F. S. Chapman, ornithologist and ski expert; Q. Riley, meteorologist; W. E. Hampton, engineer; Lieut. M. Lindsay, surveyor.

Two men are still needed to complete the team, and it is hoped that one of them will be a naval surgeon.

When last year a few Fellows of the Royal Geographical Society decided that the time had come to work out an air route to Canada over the Arctic, the project was referred to Canada and represented there, by permission of the Governor-General, by a member of his staff. Mr. Mackenzie King, the Prime Minister, spoke of the project during a tour of the Dominion, and a Canadian committee was formed in Ottawa, including Major-General MacBrien, President of the Aviation League of Canada.

The Committee formed in England to get together and equip the Expedition consists of Major Stephen Courtauld, chairman; Mr. H. G. Watkins, leader of the Expedition, and of two previous Arctic expeditions; Mr. Andrew Holt; Mr. J. M. Wordie, who was with Shackleton in 1914–17, and leader of many Arctic expeditions; Capt. Ralph Rayner, of the Royal Signals, the hon. secretary of the Expedition and member for Canadian liaison; and Mr. Augustine Courtauld, member of two expeditions to Greenland.

The Prince of Wales has consent to become Honorary President of the Committee. The Expedition has been financed by certain members of the Committee, supported by a few other benefactors. The whole project of the British Arctic Air Route has been recognized by several Government Departments. The Air Ministry has lent a Royal Air Force officer, the War Office a wireless officer, and the Admiralty, it is hoped, will lend a naval surgeon. Many departments have helped with the loan of instruments, and the Royal Geographical Society has aided the Expedition both technically and financially. Vickers (Aviation), Ltd., have offered a "Vellore" aeroplane for the experimental flight over the whole route next year.

Mr. Scott is at present on the west coast of Greenland, collecting teams of dogs which he will ship to the Faroe Islands, to be picked up by the *Quest*.

NEW "CALCUTTA" FOR I.A.L.

LAST week we had the good fortune to be at Rochester on a day when, as it happened, a Short "Calcutta" flying boat was due to be put through an hour's acceptance test for Imperial Airways, carrying full load. By the courtesy of Short Brothers, we were privileged to make one of the party who went up in the machine, and it is thought that a few impressions of the flight may be of interest to our readers, few of whom have probably had the opportunity to sample for themselves the pleasures of being passengers in a modern commercial flying-boat.

A large quantity of sand ballast had previously been loaded on board the machine where she rode to her buoy in the Medway, and the rest of the load was composed of passengers, some of whom were the official representatives of Imperial Airways, observing the tests on behalf of that company, while others, like ourselves, were mere joy-riding passengers, free to enjoy the flight without irksome duties to perform.

The new speedboat which Shorts have recently bought from Mr. Hubert Scott-Paine, of the British Power Boat Company, took us out to the machine, and soon Mr. Lankester Parker was at the controls, the cabin hatch closed and everything ready for starting. The three Bristol "Jupiter" engines were started with surprisingly little fuss and in a remarkably short space of time, the mooring rope was cast off and we were headed towards Rochester bridge. Throttling down the wing engine on one side and opening the throttle of the other wing engine, the "Calcutta" pivoted around in her own length and headed into the wind. The roar of the three engines indicated that Parker had "given her the gun," and the machine quickly gathered speed. For a second or two the water washed across the cabin windows, shutting out all view. Then the "Calcutta" got on her step and soon was clear and in the air, the time taken being very short in spite of the heavy load.

Swinging inland to the south of the Medway, we headed for the estuary, climbing all the while with the engines nearly full out, the time to reach 5,000 ft. being one of the tests to be carried out. The weather was excellent, with good visibility, but the air was rather bumpy. Even so, the "Calcutta" was remarkably steady, and the only occasion when it became necessary to grab hold of anything was when the machine struck a bump just as one was walking about in the cabin to get a view of some particular object below.

The stipulated altitude of 5,000 ft. was reached in very good time, and we then came down to 2,000 ft. in order to do a fuel consumption test at cruising speed. During the climb, with the engines running at nearly full power, the noise in the cabin had been just about what one gets in most machines when cruising. When the engines were throttled down to cruising speed, the noise decreased markedly, and it became possible to converse in very nearly a normal tone of voice. Certainly, the noise was less than that in a London underground train.

For half-an-hour we cruised around over the Thames Estuary district, and many a yachtsman would have given much to be able to see as much of the marshland around Sheerness as we could. In one half-hour we surveyed from above the rivers and creeks which the owner of a yacht would likely take months or even years to see. Along the Essex shore we passed, with Shoebury, Southend, Leigh and Canvey Island standing out clear and distinct in the sunshine. Then the half-hour was up and Parker came down to about 20 ft. to put the Calcutta through a full-speed test near the water. Steamers, barges and yachts slid past the cabin windows at great speed, and the airspeed indicator hovered around 127 m.p.h. In spite of the speed and the low altitude, one felt a security which can never be experienced in a land machine. Should the extremely unlikely possibility happen of all three engines stopping, there was smooth water under us and a safe alighting could be made anywhere. We venture to think that even the most nervous person would have felt no uneasiness whatever, and after one experience would never again have the slightest fear of travelling by flying-boat.

The climb, consumption and speed tests having been successfully completed, it only remained to test the ability of the machine to fly on any two of her three engines. This she successfully did, and soon we were gliding down over the bridge at Rochester, to touch the water again without the slightest jar or bump in front of Shorts' works. The buoy was picked up in a few seconds, the engines stopped, and we went ashore, more than ever convinced that "the flying-boat is the thing."

◈ ◈ ◈ ◈

Maps for King's Cup Air Race

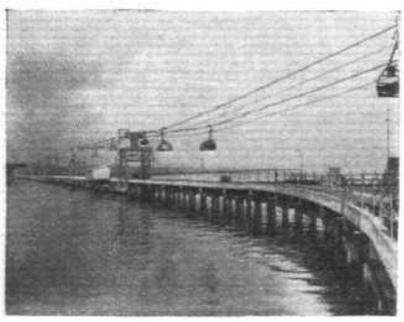
THE Automobile Association is preparing special maps for the King's Cup Air Race on July 5. These maps incorporate the usual full particulars given on all A.A. flying maps, and have been made specially light and compact. The set of maps for the whole course weighs only 11 oz., and the price to members is £3.

A.A. flying members who wish to purchase sets of these maps are advised to communicate with the Association as early as possible.

The Refinery at Fawley, which is operated by the Agwi Petroleum Corporation.

AN ENGLISH OIL REFINERY

THIS industry, although young, has provided, not only at Fawley but in other parts of the country, a great impetus for the employment of British labour, not only in the actual refining operations, but in many other directions, for practically every item of plant which could be obtained in this country is of British manufacture, and has thereby been of substantial benefit to British industry, especially the steel industry. The refinery has from the beginning necessitated an outlay of capital of considerably over £2,000,000, the largest portion of which has been spent in this country. A number of new vessels for the transport of crude oil to the refinery are on the stocks in British shipyards. At the present moment the products obtained from the various crudes are as follow :—



The Ropeway and Sea Loader.

Natural petrol, cracked petrol, kerosene, tractor oil, fuel oil, road asphalts.

Most of these products are marketed in England by the Anglo-American Oil Company, with the exception of tractor oil and some asphalt, which is reserved for the Continent. It is significant that freight by sea from the States is 22*s*. 6*d*. per ton, whereas from Fawley to London by rail it is 27*s*. 6*d*. per ton ! Both the natural and the cracked petrol are carefully blended to provide the brands of Pratt's High Test, Pratt's Ethyl, and Pratt's Commercial spirit.

The fuel oil manufactured at Fawley is delivered under contract to the Cunard and White Star Companies, as well as the Hamburg-Amerika liners.

The road asphalts, of which there are many grades, are used for all classes of road construction and repair throughout the kingdom, and may be recognised under the " Circle and Bar Standard Sign " on all roads.

The crude oil is imported by large ocean-going tankers up to 15,000 tons, and is discharged at the main jetty into main crude oil storage tanks. From there it is transferred by pumping in a continuous manner through the crude plant, which consists of cylindrical and pipe stills.

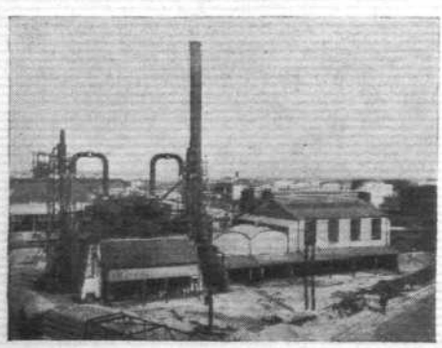
The refinery handled 826 vessels at its jetties during 1929, representing approximately 800,000 tons of oil products, and the advantage to the Port of Southampton of this added traffic is readily appreciated.

A branch line from Totton, 10 miles away, has been constructed to link up with the main Southern Railway system.

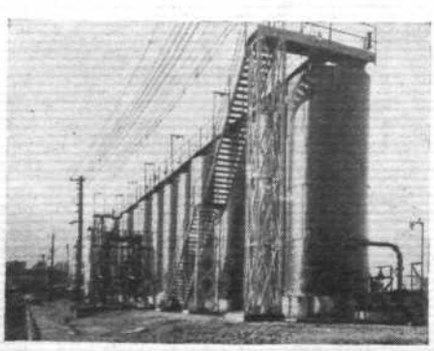
The refinery employs 700 operatives, and during construction periods the number has been about 1,500.

A recreation Club provides many indoor games and more recently it has been decided to add a bathing section, and to this end two bathing huts have been erected on Calshot Beach.

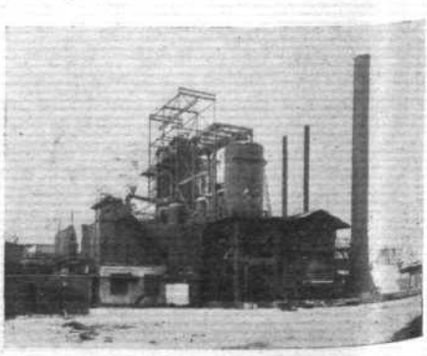
Another feature of the club's activities has been the publishing of a club magazine, and there has been no doubt as to its popularity.



The Asphalt Stills.



The Washing Plant.



The Crude Stills.

CROYDON WEEKLY NOTES

IT is good to see Major Brackley amongst us again, resuming his former duties as Imperial Airways' Air superintendent, after nine month's absence in the East, where he has been chiefly at Cairo and Delhi organizing the air routes. He is full of enthusiasm and praise for the very excellent work the pilots out there are putting in, and recounts many interesting experiences.

Capt. Woolley-Dodd has also returned from his survey flight from the Cape to Khartoum, and is having a well-earned "spot" of leave, before taking over charge of the African route.

Sabena pilots seem to be catching all the bad weather lately—this time it was M. Cocquyt, who at 2 a.m. on Tuesday morning ran into a thick fog, which came up suddenly at Croydon, Kenley and Biggin Hill, and although he could see the lights of these three aerodromes from above, it was impossible to distinguish anything near the ground.

After making several unsuccessful attempts to land amid "salvos" of star shells, he finally adopted a clever piece of strategy—flying very low near the south-east corner of the aerodrome, where he knew there were no buildings or obstructions, he crossed Purley Way at right angles, and taking a line on the Neon "Tee" dropped in below the Neon Beacon, and gradually flattened out, knowing he had best part of a mile of clear ground in front of him.

His landing was perfect, but so thick was the fog, that he had to await the arrival of the aerodrome tender to show him the way to taxy to the Tarmac. A wonderful effort of piloting, but, oh! the suspense to the onlookers :—

"We ses to our fluttering heart-strings,
We ses to 'em—Peace be still"

Even though he does "hide his light under a bushel," "Cap" Muir's splendid flying instruction cannot escape notice—one of his pupils, Mr. E. L. Hook, took his "A" licence after 3 hrs. 30 mins. solo, on Tuesday, and the next day, wishing for a little cross-country practice flew to Paris like an old stager, in normal time, returning next morning quite unconcerned, and—be it added—carried out all the circling regulations correctly.

Mr. R. B. Waters at Penshurst is still very busy on school work, and has turned out two more "A" licence pilots, Messrs. Clemetson and Bruce, whilst Mr. Morton, a candidate for "B" licence, successfully passed his night flying tests at that aerodrome on Wednesday.

One of the smartest and fastest light 'planes ever seen in this country came in on Thursday. It was a German cantilever biplane, D.18, of the Academic Flying Group, Darmstadt, designed and built by students out of sheer love of aviation.

This type has been developed out of the gliders used at the Wasserkuppe, and with a "Genet" engine, is credited with a speed of 140 m.p.h., which is a record for light 'planes. Herren Neininger and Fischer are demonstrating the machine, which they flew to Bristol for the international air pageant in connection with the opening of the new air port. Three French machines also went to Bristol—a Caudron monoplane piloted by M. Delmotte, who has been flying since 1913, and is now the Caudron Co.'s test pilot; a Farman monoplane, 190, piloted by MM. Bailly and Reginensi, who did the Paris-Saigon return and Paris-Madagascar return flights on this machine; and a Loire et Oliver "Golden Ray," with MM. Bajac and Bonderie, who "Micawber-like," we can surely call "friends of our youth who knew us in our prime," for they have been with us since the good old Hounslow days nearly 11 years ago.

All these gentlemen were delighted at their magnificent reception by officials of Bristol club, and the wonderfully good relationship existing between pilots of all nationalities.

On Saturday morning, after a journey of exactly two hours, Jimmy Youell arrived from Paris on a "Special," G-EBIX, with the Lord Mayor of London and his suite (I nearly said Cat!).

A few minutes' delay in opening the door which operates from the inside started some wag singing, "Barnacle Bill the Sailor."

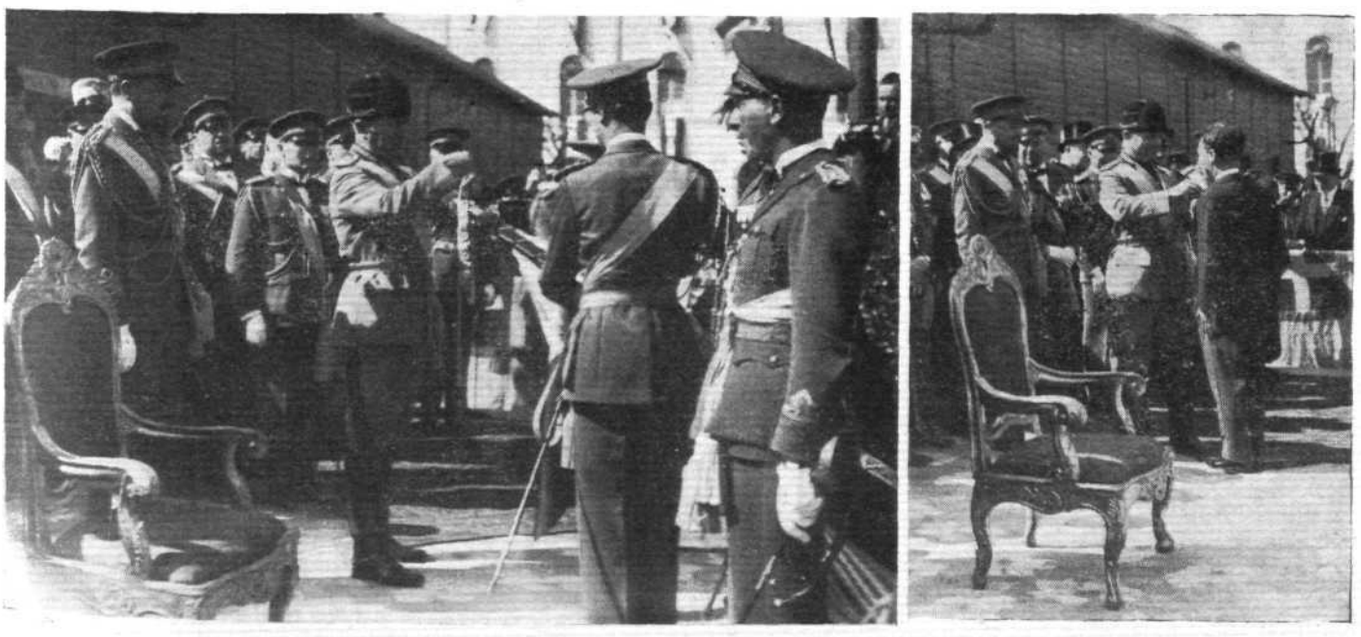
Yet another new company, "Walcot Air Lines, Ltd," has been formed for air taxi work, special charter machines, etc., in addition to which a regular service will be run to and from Le Touquet. Two Junkers F13's will be used for this purpose, the pilots being Maj. Clarke and Capt. Gibbons, and the engineer, Mr. F. G. Amers. Shortly after mid-day they both arrived from Germany and were escorted round the aerodrome by the Junkers Junior, which was "gyring and gimbling" in the air.

The three silver monoplanes had the tarmac all to themselves when they lined up—Ma, Pa and Baby—"Junkers über Alles."

A pretty christening ceremony of the new machine was performed on Sunday morning by Lady Horne, who left immediately afterwards with a party of friends for Le Touquet on G-EAGU, piloted by Maj. Clarke.

Capt. Kingsford-Smith and Mr. E. Vandyke are here with "The Southern Cross," VH-USU, on which they are going to make their east to west Atlantic flight. Vandyke is very confident and optimistic over the project, and—as those who know him will agree—when he makes up his mind to do anything he generally succeeds.

"BILL."



THE DUCE DECORATES ITALIAN AIRMEN : On the occasion of the seventh anniversary of the constitution of the Italian Royal Air Force, recently, Signor Mussolini conferred several decorations, etc., on Italian airmen. Our picture shows, on the left, the Duce affixing a silver medal on the Colours of the R.I.A.F., and on the right, decorating Renato Donati with the silver medal for Valour.

THE DEVELOPMENT AND PROGRESS OF THE AERO ENGINE*

By H. R. RICARDO, F.R.S., F.R.Ae.S., M.I.A.E., Assoc.M.INST.C.E.

THE possibility of sustained flight by heavier-than-air-machines was fully recognized during the last century by those who had studied the aerodynamic problems involved, and it was realised that its accomplishment awaited only the development of a prime mover of sufficiently light weight.

Of all the known forms of prime mover, the internal-combustion engine alone held out any promise of fulfilling the conditions necessary for sustained flight, namely, light weight not only of the engine itself, but also of the fuel it consumes. Early attempts had, however, been made to fly with steam propulsion, and it is of interest to note that the very remarkable and cleverly-designed steam plant employed by Sir Hiram Maxim, in 1894, was actually very considerably lighter per horse-power, even including the boiler and condenser, than the petrol engine used successfully some nine years later by the Wright Brothers. Although, in the last century, short flights would have been possible with the aid of the steam engine, yet with so hungry and thirsty a creature, prolonged flight was quite out of the question, on the grounds of catering alone.

The rapid progress of the internal-combustion engine during the last 50 years has been one of the most remarkable developments of mechanical engineering. Fifty years ago, its minimum weight was about 500 lb. per horse-power, and its use, in consequence, was restricted solely to stationary purposes. Forty years ago it had dropped to about 75 lb. per horse-power, and its use for road transport began to develop. Thirty years ago its maximum weight had dropped to about 10 lb. per horse-power—by this time it had already begun to revolutionize road transport and the victory of the air was close at hand. Twenty years ago its weight could be reduced to 3 lb. per horse-power, and flight had become an accomplished fact. Since that date, the minimum weight has dropped further to a little over 1½ lb. per horse-power, and in the case of racing engines to well below 1 lb.

The achievement of flight made its deepest impression in France, and it was France alone who, during the first few years after the Wright Brothers' success, grasped the immense future of aviation, and at once devoted her best talent to the development of suitable engines. Of these early developments the most brilliant, the most original and the most daring example was the 50 h.p. Gnome engine designed by Monsieur Seguin. This remarkable engine, which was actually in use as early as 1907, weighed less than 3 lb. per h.p.; it was quickly followed by a larger version in which the weight was further reduced to but little over 2 lb. per h.p., and this, in turn, was followed by the Gnome Monosoupape engine, an even more daring design by the same author. In the Gnome engine we have an example of a complete departure from all past experience and tradition, such as has seldom occurred in any engineering development. Of other engines designed and produced in France solely and specifically for aircraft during these early days, one may cite such examples as Le Rhone, Clerget, Canton-Unne, Renault, Anzani, and many others to indicate the great confidence which France and the French manufacturers placed in the future of aviation. During the same period we, in England, made only very half-hearted and sporadic attempts to produce an engine suitable for aircraft. Doubts as to the commercial future and the belief ingrained in all English engineers that after oak, cast-iron was the bulwark of Great Britain, combined to hinder development in this country. It was not, in fact, until halfway through the Great War that we were able finally to break with the cast-iron habit and to abandon a material which had served our forefathers so well for lamp-posts and kitchen ranges.

During the war, the aero engine underwent a period of intensive development to which was devoted all the best talent of the countries concerned, together with unlimited resources of every kind. We, in this country, entered the war with only one engine with any considerable flying experience to its credit, namely, the much-abused, but very serviceable R.A.F. engine, and we were forced, at the start, to rely almost entirely on our ally, France, for the supply of designs and experience, but it is satisfactory to record that before the end of the war the position had been reversed and that English-designed and English-built engines were in the ascendancy.

Since the war progress has been steady; for the last 10 years it has taken the form of improving and consolidating existing design, and there have been few startling developments. During this period, the power output of a given size of engine has been increased by an average of about 40 per cent., thanks, in part, to improved knowledge of the thermodynamic and other problems involved, in part to progress in metallurgy and to the use of more suitable fuels, but mainly to meticulously careful design, and the daily application of an ever-widening experience in service. The power-weight ratio has not, however, fallen to the same extent because demands in other directions, such as smoothness of running, a longer working life and refinement generally, have in every case caused the same engine to put on flesh as the years roll by. To-day the modern aero engine is not only about the most efficient prime mover in existence, but it is also one of the most reliable.

If we review the progress of engineering in the past, we find that each new line of development starts of course with a period of experiment and groping, during which a wide range of types is evolved. By a progress of elimination, this range is very soon whittled to one or two survivors; in the final choice of these survivors, chance plays often quite as important a part as merit. On the one or more survivors the attention of the whole engineering world is concentrated, with the result that step by step it is improved out of all recognition, and reigns supreme until it reaches almost the very limit of its capacity when a new and fundamentally better type eventually replaces it. Such has been the history of the steam engine, which 50 years ago had crystallised into an almost standard design of open-type, double-acting, slow-running engine; for many years this held undisputed sway, until it was displaced by the enclosed high-speed vertical type; this, again, was perfected until it seemed almost final, only to be superseded in turn by the turbine. That this process is so prolonged, and that the obsolete so long outlives its days is due to the fact that in every age the newcomer, in its raw and undeveloped state, is invariably pitted against the champion of the older school and challenged to defeat it in the first round. Allowance is seldom made for the fact that the reigning type has enjoyed the benefit of many years' experience under every conceivable condition, supplemented by the combined skill of the best talent in the country, while the newcomer, of course, lacks these advantages. Particularly does this apply to the question of reliability, for reliability is attained only by prolonged experience both in manufacture and in service, none of which are available to the newcomer. It is this attitude of mind, this want of imagination perhaps, which frequently delays progress and allows obsolete types to outlive their day, and it is an attitude which is particularly prevalent in this country.

Since the war, the trend of aero engine design has settled down to two highly-developed types of poppet-valve petrol engines, the air-cooled radial and the V-type, water-cooled engine, both of which have approached the extreme limit of their capabilities—what further scope is left for increase of power, reduction of weight, or improvement in economy can now be of a small order only, and, by analogy from the past, it would seem that the time is almost ripe for some innovation more radical than mere detail improvement. (A lantern slide showed, in graphic form, the improvement in power-weight ratio of the four leading British engines during the last 10 years, from which it was seen that the curve had already almost flattened out.—Ed.) Power-weight ratio of the engine alone is not, of course, by any means the sole criterion; fuel economy is to-day of equal, and in many cases, even greater importance, but here also the curve appears to have flattened out. The average test-bed consumption figure of the engines submitted to the Army and Navy competition tests in 1914 was 0·78 lb. per brake horse-power hour, that of the best 0·65 lb. The average consumption of aero engines under similar test conditions in 1922 was about 0·55 lb., and that of the best about 0·48 lb. The average consumption to-day is about 0·52 lb., and of the best examples about 0·46 lb. It may be argued that the performance of the Rolls-Royce and Napier engines which performed so magnificently in the last two Schneider Trophy races belies what I have just said, but it will, I think, be admitted that the superb performance of these engines was attained not so much by improvements which could be incorporated in the normal type, but rather by the use of expedients rendered possible by the conditions of the race,

* Abstract of Wilbur Wright Memorial Lecture read before the Royal Aeronautical Society on May 30.

chief of which was the use of specially prepared fuel, and by encroachments on the margin of safety

We have seen that during the past 12 years, the average power output of aero engines of given cylinder capacity has increased by about 40 per cent., and it is worth while to try and analyse the progressive steps by which this improvement has been attained. In the first place, there has been an all-round increase of nearly 20 per cent. in the mean effective pressure—this has been attained in part by detail improvements in valve design and operation; in part by the use of a higher compression ratio rendered possible by improvements in the fuel; and in part by improved knowledge of combustion chamber design. There has been an all-round increase in the rotational speed of rather over 20 per cent., brought about by improvements in materials, in mechanical design and in the technique of manufacture, and lastly, there has been an improvement of well over 100 per cent. in the life of the engine between overhauls brought about by extensive experience and meticulous attention to detail. Every increment of power has added both to the dynamic and to the heat stresses, and has had step by step to be met by improvements in cooling, in lubrication, in material, and in structural stiffness. Each step has revealed the presence of some weak link in the mechanism, and a halt has had to be called till that link could be strengthened. Thus the process has continued, for ever halting to overhaul the chain until ultimately every link will be of equal strength and the limit of the type will be attained. At one step the valve mechanism sets a limit to our speed; next it is the connecting-rod big-end bearing which is overloaded; at the next step the exhaust valve is overheated, or it may be the sparking plug; next detonation intrudes, and so, little by little, fighting every obstacle as it arises, the existing types of aero engines are improved until to-day they represent the very summit of engineering skill.

The improvement in engine performance during the past 10 years is due, in no small measure, to the improvement which has been effected in the quality of the fuel, in particular as regards its tendency to detonate.

Petrol, as such, consists of a mixture of hydro-carbons of three series, aromatics, naphthenes and paraffins in varying proportions, depending on the locality of the oil wells. Of these, the former, of which the best-known members are benzole and toluene, are the least prone to detonate, while the paraffins are the worst offenders. It was found that by increasing the proportion of aromatics—by suitable blending—detonation could be reduced enormously, and much higher ratios of compression could be used with a corresponding gain in power output and efficiency.

Looking back over the last 12 years, we find that the general improvement in the fuels resulting from better knowledge of the behaviour of their several constituents has accounted for an all-round increase in power output and economy of from 10 to 15 per cent., due to the higher ratios of compression which can now be used. Of the 40 per cent. increase in power gained during the last 10 years from 10 to 15 per cent. is due, therefore, to the general all-round improvement in the fuels available.

More recently, it has been discovered that certain metals such as lead, thallium and others, suppress detonation when administered even in minute doses, due, it is believed, to their avidity for oxygen, which induces them to rob the unstable peroxides which are present as an intermediate product of combustion and whose instability is the primary cause of detonation. Clearly we cannot, in practice, introduce metal in a sufficiently finely-divided form into the cylinder of an engine, and a suitable compound must be found which is soluble in petrol and which will break down, by dissociation, after its entry to the cylinder. We have also to face the difficulty of getting rid of the metallic oxide left over after combustion. Of the suitable metallic compounds, lead tetra ethyl is the best known; this fulfils the required conditions both as regards solubility in petrol and as regards dissociation at an appropriate temperature, while the residual oxide can, to some extent, be carried away by the addition of ethylene dibromide, but to some extent only—with the use of this mixture there is still some residual deposit left, and this is liable to break down the insulation of the sparking-plug; hence the use of these anti-detonating metallic dopes is limited to very small doses, or to special occasions only.

Air *v.* Water-Cooling

Since flight first started controversy has raged as to the relative merits of air *versus* water-cooled engines and to-day we are no nearer settlement. In England and in America a slight preference is shown for the air-cooled engine; in France, Germany and Italy there is a slight preference for the water-cooled engine. The advantages of the air-cooled engine are so obvious as, at first sight, to appear almost overwhelming.

(1) It is far less vulnerable;
(2) It is lighter; in actual fact the dry weight of both air- and water-cooled engines is exactly the same; hence, the water-cooled engine is the heavier to the extent of the water and radiator it must carry.
(3) It is completely immune from all "plumbing" troubles to which the water-cooled engine is very susceptible.
(4) It cannot be damaged by frost.

The disadvantages attached to air-cooling are:—

(1) As yet only one successful type of air-cooled engine of large power has been produced, namely, the radial type. As the power output of this type increases so also does its already considerable frontal area, and the advantage gained in the way of reduced weight is more than offset by increased head resistance. This does not apply to the water-cooled engine to anything like the same extent.
(2) In any internal-combustion engine the intensity of heat flow is greatest at certain localised points such as the immediate surroundings of the exhaust valves and sparking-plug. In the water-cooled engine heat can be transferred from any local point at an almost limitless rate, but in the air-cooled engine this is not the case, with the result that to avoid local overheating the air-cooled engine has to expend far more energy on cooling itself, in order to scoop the heat out of a few odd recesses; even so, the air-cooled engine is forced to work at a lower efficiency and with more lavish lubrication.

From the time when flight first started till the present day, the scales have failed to show any decided tilt towards air- or water-cooling. It is, perhaps, significant that air-cooled engines predominate in those countries where frost is of frequent occurrence, and water-cooled engines elsewhere, thus indicating that, in practice, the least important of the advantages is sufficient to tilt the scale. While the more extensive use of high conductivity aluminium cylinder heads tends to widen the scope of air-cooled engines, the use of steam cooling, and perhaps also the use of liquids of higher boiling and lower freezing points, such as ethylene glycol, gives a corresponding leg up to the water-cooled engine. Steam cooling in particular appears most attractive in that it is far less vulnerable, while not only can the surface of the radiator or condenser be reduced, but it can be placed anywhere and made in any convenient and streamline form; thus the leading edge of the wings may be utilised as the condenser surface. The only real advantage I can see in favour of the use of ethylene glycol lies in its low freezing point, for little or nothing is to be gained from its higher boiling point seeing that the boiling point of water is quite as high a temperature as is wholesome; for any higher temperature results merely in loss of power and an increased tendency to heat troubles, such as gummed-up piston rings, etc.

It is perhaps worth while to consider what scope is left for improvement of aero engines of the present generally-accepted types. The power output of any engine is a product of the weight of air it can consume in unit time and of the efficiency with which it can be utilised. With engines of conventional type we can increase the efficiency only by the use of higher ratios of compression, but in this direction we are limited in part by the fuel and in part by the fact that as we increase the compression ratio the gain in efficiency diminishes, while the increase in maximum pressure rises alarmingly.

We can increase the weight of air taken into the cylinder by:—

(1) Using oversize cylinders and working them at full capacity at high altitudes only;
(2) Increasing the speed and so filling the same cylinder more frequently; or
(3) By supercharging and so overfilling the cylinder.

The use of over-size and under-filled cylinders has never proved very successful in practice because it is the dynamic loading rather than the gas pressure which, at the reasonably low pressures used in petrol engines, decides their scantlings and dimensions with the result that the over-size cylinders are liable to involve an over-size engine generally and the advantage is lost.

The second alternative, namely, increase in speed, involves a large increase in the dynamic forces which vary as the square of the speed. This, in turn, can be met by the use of smaller cylinders in larger numbers and the trend of development is

certainly in this direction, but is limited by the necessity for duplicate ignition systems which become increasingly heavy and complex as the number of cylinders is increased; the same objection applies also to carburation and distribution.

The third alternative, namely, supercharging, offers at present much the widest scope for power increase, since the weight of air dealt with can be supplemented to any extent without increasing the dynamic forces, but unfortunately, only at the cost of a very large increase in the heat stresses, some loss in fuel economy and a great increase in the tendency to detonate.

In the poppet-valve engine of to-day the exhaust valve is the weakest link in the chain and it is the strain on this link in particular which is accentuated so enormously by supercharging.

As yet and apart from racing engines no one has, by supercharging, succeeded in increasing the ground level power of aero engines, using ordinary aviation fuels, by more than about 10 per cent., the limit being set by the intrusion of detonation andpre-ignition arising from the overheated exhaust valve and plug points. In the case of racing engines very special fuel mixtures can be prepared which will resist detonation and thus allow of the combination of supercharging and a high compression ratio and so greatly relieve the distress of the exhaust valve. Although the presence of the exhaust valve forbids at present the use of any substantial increase by supercharging on the ground, this, of course, does not apply at high altitudes, where the supercharger may be used to restore ground level pressure in the cylinder, and it is in this direction of maintaining ground level power at altitude rather than an all-round increase in power that supercharging is employed, and to this it must probably be restricted so long as the exhaust valve is with us.

Three general systems of supercharging have been tried :—

(1) The exhaust-driven centrifugal blower;
(2) The gear-driven centrifugal blower; and
(3) The positive displacement type blower.

Of these the exhaust-driven blower was developed actively, both during and just after the War; it appears at first sight to be the most attractive, since the waste energy in the exhaust gases can be utilised. In practice, however, it has proved very disappointing; in the first place, the efficiency of the turbo blower is too low, with the result that the loss due to back pressure on the exhaust is equal to, if not greater than, that of driving the blower by gearing, while the festoons of red-hot exhaust pipes add to the head resistance of the machine and increase greatly the fire risk.

The exhaust-driven fan has now been superseded by the gear-driven type with which ground level density can, if required, be maintained up to an altitude of over 12,000 ft., while in very extreme cases, such as that of the Rolls-Royce Schneider Trophy racer, a pressure as high as 14 lb. per square inch above atmosphere has been maintained in the induction pipe, but this was assisted by the forward speed of the machine which, coaxed by a suitable orifice, contributed about 3 lb. per square inch.

In America, the displacement type blower has been used, experimentally at all events, with considerable success. This type would appear to have some decided advantages. In the first place, it runs at a relatively low speed, hence the gearing problem is greatly simplified; its efficiency is at all times very slightly greater than that of the centrifugal type, and it is capable of a higher pressure if and when required; lastly, the power absorbed by the blower when not in service, or when operating at low pressure, is considerably less. The design and manufacture, however, of a displacement type blower involve some very difficult mechanical problems, necessitating the use of very small clearances in a piece of mechanism of large dimensions, liable to distortion and subjected to considerable changes of temperature.

Apart from its use in augmenting the power output, the supercharger plays a valuable part in assisting carburation and distribution. In a multi-cylinder engine the number of carburettors can be reduced and the induction pipe work simplified very considerably.

Sleeve-Valve Engines

Throughout the whole life history of the four-cycle internal combustion engine the exhaust valve has always been the weakest link in the chain. This valve is called upon to operate under exceptionally severe conditions both as regards temperature and mechanical stresses, and in recent years it is almost true to say that the power output of the petrol engine has increased year by year by just the extent to which the metallurgist has improved the material of this critical member. The metallurgist is now probably near the end of his tether and, in any event, the working temperature of the exhaust valve head has now attained so high a level as to promote appreciable surface combustion during the suction and compression strokes of the engine, thus not only wasting a small proportion of the fuel, but what is far more serious, raising the whole cycle temperature and thereby increasing the tendency to detonate. If to cool the exhaust valve we increase the ratio of expansion we at once increase the tendency of a normal fuel to detonate. If we reduce the ratio, we increase the temperature of the exhaust. Thus, a vicious circle is set up from which there seems no escape so long as we tolerate within the combustion chamber a member whose surface is considerable and whose temperature is far above the self-ignition temperature of the fuel. If, therefore, we are to look forward to any substantial increase in performance or to the application of supercharging for purposes other than altitude compensation, we must first abolish the exhaust valve. In the light of present knowledge the only practicable alternative would appear to be the single sleeve valve. This mechanism has also other advantages. In the first place, it is controlled mechanically throughout its whole movement instead of in part mechanically and, in part, spring-operated as in the case of the poppet valve; moreover, since its velocity is almost uniform there are no appreciable acceleration forces for the mechanism to contend with; hence, so far as the valve gear is concerned, the engine speed may be almost unlimited. The absence of any hot surface in the combustion chamber allows of a much higher ratio of compression ratio being used, actually about one whole ratio higher, or conversely it permits the use of inferior fuels.

Lastly, since the engine breathes through gills rather than nostrils, neither the shape nor the cooling of the head need be cumbered by the organs of respiration.

As I have mentioned previously, our best hope of reducing weight lies in the application of supercharging, not only as an altitude correction, but to give an all-round increase in power. The exhaust valve, however, forbids any large increase in ground level horse-power except when, as in the case of last year's Schneider Trophy races, a very special fuel is employed. With the single sleeve-valve engine there is no such limitation and an experimental single sleeve engine has been run heavily supercharged for several hundred hours on ordinary aviation spirit at a brake mean pressure of over 400 lb. per square inch and at a specific output nearly three times greater than that of any aero engine now in service, and that without the least sign of distress or overheating of the sleeve valve. With a fuel comparable with that used in the Schneider Trophy, the same engine will maintain a brake mean pressure of 550 lb. per square inch when the specific output is almost double that of last year's Schneider Trophy winner. With high degrees of supercharge the energy available in the exhaust becomes so large as once again to bring into prominence the vexed question of compounding. In the case I have just cited the exhaust is discharged from the cylinder at a pressure of well over 300 lb. per square inch and, as such, is capable of doing again almost as much work in a low-pressure cylinder as it has done already in the high pressure. In the case of the poppet-valve engine, compounding is not worth the candle, because the exhaust valve cannot in any event be made to operate under such severe conditions, while the mechanical and other problems connected with the design of a suitable transfer valve from the high to the low-pressure cylinder appear to be almost insuperable. With the sleeve-valve, however, compounding becomes comparatively easy because the same valve can be arranged to operate both as the inlet and exhaust valve to the high pressure and as the inlet valve to the low-pressure cylinder. By compounding in this manner it should be possible not only considerably to improve the economy but also to reduce weight, since the cylinders which alone have high pressure and temperature to deal with, can be made quite small while the low-pressure cylinder can be made very light. In a supercharged compound engine one would aim to do the bulk of the work in the two-cycle low-pressure cylinder and to use a pair of quite small high-pressure four-cycle cylinders both to take the bite off the pressure and temperature and to serve as valve gear for the low pressure.

I have enlarged on the question of the single sleeve valve because its use would appear to open up new possibilities unattainable with the poppet-valve engine. In the case of water-cooled engines it would seem that the sleeve valve could be substituted for the poppet valve without any material difficulty or additional weight.

In the case of air-cooled engines, however, the problem of cooling the hollow cylinder head of a sleeve-valve engine is likely to prove difficult and very little experience is as yet available.

It has been shown, experimentally, that the sleeve-valve engine is capable of a far greater power output than is attainable from any design of poppet-valve engine yet in sight, but I would like again to emphasise that while the high duty sleeve-valve engine is a possible new-comer, it must not be expected in its relatively undeveloped condition at once to outstrip the poppet-valve engines of the present day.

In the Army and Navy Competition of 1914, a single sleeve valve engine was entered and put up a very good performance. It failed through the breakage of its crankshaft, but its performance in every other respect called forth a warm tribute from the judges in their report.

Compression Ignition

During the last few years aero engine designers in every country have been turning their attention to the compression ignition or heavy oil engine.

The principal arguments in favour of this engine are :—

(1) The elimination, or at all events the enormous reduction, in the fire risk ;
(2) Much better fuel economy ;
(3) The elimination of electric ignition and thus of interference with wireless communication ;
(4) The use of a cheaper fuel.

These are all weighty arguments, and sufficient to justify the large amount of thought and research which is now being lavished over the problem.

The heavy-oil engine was evolved and developed by the last generation as a slow-running engine for heavy industrial work and its secrets had been so jealously guarded by the last generation and so enshrouded in mystery that for many years none dared tear aside the veil and reveal it as it is—a very commonplace type of heat engine. For twenty years its high priests have assured us that it would work only at a leisurely gait and that it was sheer impudence even to suggest a high-speed version. A few mischievous spirits had made timid attempts to hustle it, but it was not until nine years ago that the Royal Aircraft Establishment stepped boldly in and showed that, treated rough, it could step quite as lively as any other heat engine. To the Royal Aircraft Establishment is due the credit of having first shown the world that the high speed heavy-oil engine was not only a practical possibility but that it could actually be made more efficient than its clumsy prototype. The pioneer work by the R.A.E. was soon followed up by other experimenters until to-day almost every aero engine builder throughout the world is experimenting with the heavy-oil aero engine and in almost every case he is finding the problem far less difficult than he had expected. In two quite recent papers I have discussed fairly fully the question of combustion in heavy-oil engines and will not attempt to do more than summarise the conclusions. In the high-speed compression ignition engine with what is termed solid injection, combustion appears to take place in three distinct phases. First, a delay period during which fuel is admitted to the cylinder but either fails to ignite or burns only from one or more minute nuclei ; secondly, a period of rapid pressure rise during which the fuel which has already been injected burns rapidly at a rate determined by the degree of turbulence within the cylinder ; this continues until the pressure and temperature have reached so high a figure that the remainder of the fuel can burn as it issues from the injector. During the first two phases the pressure rise is largely out of direct mechanical control, but, during the last phase, it is controlled entirely by the rate of injection from the fuel pump. The smaller the cylinder, or the higher the speed, the longer the delay period, hence more fuel is burnt under the condition of phase two and the maximum pressure is higher. Thus, while a 5½-in. cylinder working at 1,500 r.p.m., will give a certain performance at a maximum pressure of 750 lb. per sq. in., to get the same performance at 2,400 r.p.m., we have to let the maximum pressure rise to about 850 lb. per sq. in. Again, if we reduce from 5½ in. to, say, 4 in., we shall have to let the maximum pressure rise by nearly 100 lb. per sq. in. to obtain the same performance.

In order to obtain the necessary rapid and complete combustion, it is essential that the relative motion between the droplets of liquid fuel and the air within the combustion chamber shall be extremely rapid. Such rapid relative motion can be attained either by shooting the fuel through the air at a very high velocity or by making the air within the cylinder rush past the entering stream of fuel. The former method involves very high injection pressures, very small orifices and accurate aiming of the several fuel jets, the latter method obviates these difficulties and allows of low-pressure injection through a single hole orifice of relatively large dimensions. It has the advantage, also, that it is almost completely immune from mechanical obstruction or disturbance. In order, however, to acquire the necessary rapid and orderly rotational flow of the air, it is essential to admit it tangentially to the cylinder and as near the circumference as possible ; in other words, through ports in the cylinder wall. This can be accomplished easily enough by the sleeve valve, or by the ports in a two-cycle engine, but it is by no means easy to achieve the same result with poppet valves. It would seem, therefore, that the sleeve renders possible a very simple, light and reliable form of heavy-oil engine. On account of the lower mean pressure, and also of the unfavourable ratio of mean to maximum pressure, the four-cycle heavy-oil engine must, of necessity, be considerably heavier than a petrol engine of similar design. From careful analysis of the various factors it would appear that, given equal skill in design and manufacture, the heavy-oil engine will be some 50 per cent. heavier than a petrol engine of the same power output and of similar general design. The compression ignition engine is, however, admirably fitted to work on the two-stroke cycle, and there seems no fundamental reason why a two-cycle heavy oil engine should not be developed whose weight would approach very nearly that of a contemporary petrol engine of the same output. With regard to fuel consumption and range, the best petrol engines of to-day show a fuel consumption on the test bed of about 0·46 lb. per sq. in. while the best experimental light heavy-oil engines show 0·35 lb. per b.h.p. hour ; this, however, is by no means a fair basis of comparison, for while the petrol engine may, with advantage, and in flight invariably does consume fully 20 per cent. of excess fuel, the compression ignition engine maintains always its maximum efficiency and, in fact, cannot do otherwise. We ought, therefore, to compare a petrol engine with a consumption of 0·55 lb. with a heavy-oil engine consumption of 0·35 lb., a difference of 0·2 lb. per b.h.p. hour in favour of the latter. If we take the weights of the fully equipped engines as 2 lb. and 3 lb. per h.p., respectively, we find that the heavy-oil engine will begin to score when the range exceeds 5 hours. Just recently the Packard Company of America have produced successfully a small radial air-cooled heavy-oil engine of quite exceptionally ingenious mechanical design, the weight of which is said to be little over 2¼ lb. per h.p.— a very fine achievement. To accomplish this, however, the reduction gear usually fitted to so high speed an engine has been omitted, and it would also appear that the margin of safety has been encroached upon considerably. There is little doubt but that a petrol engine of similar design and with the same margin of safety would weigh less than 1½ lb. per h.p.

While on the one hand it may not be long before heavy-oil engines will take the air in considerable numbers, yet I cannot see that they will oust the petrol engine ; rather, I think, each will find its own sphere of usefulness for many years to come.

The intensive research which has been carried out during the last few years on heavy-oil engines has naturally thrown fresh light on certain of the problems connected with petrol engines particularly as regards fuel distribution to the several cylinders. The petrol engine of to-day uses a carburettor and from it distributes a mixture of partially vaporised fuel and air to the various cylinders. In the event of any cylinder receiving a weak and slow-burning mixture flame lingers in the combustion chamber throughout the exhaust stroke, with the result that on the opening of the inlet valve the whole mixture in the induction pipe is ignited and what is known as a backfire occurs ; this is always alarming to the pilot and sometimes even dangerous. To avoid risk of backfire or of losing his engine when opening up after idling, the pilot invariably works with a somewhat rich mixture, which is very wasteful in fuel.

The system of distributing a partially vaporised mixture to a bank of cylinders has been in vogue since the petrol engine first appeared and though its evils are recognised they have come to be accepted as inevitable. The alternative system of injecting into each cylinder an accurately measured quantity of liquid fuel has generally been considered as altogether too difficult even to attempt. In the case of the heavy-oil engine, however, this problem has had to be solved and has, in fact, presented far less difficulty than anyone would have dared to predict Some thirteen years ago, the late Major Norman carried out some very promising experiments along these lines and but for his untimely death they would probably have been brought to a successful issue. Some five years ago and after a good deal of experience with injection problems in heavy-oil engines a long series of experiments on similar lines were again put in hand, when it was found that both a higher power output and cooler running could be obtained when the fuel was injected during the suction stroke, since

THE ROYAL AIR FORCE

London Gazette. May 27, 1930.

General Duties Branch

Flight-Lieut. I. E. Brodie is granted a permanent commn. in this rank (May 1). The follg. are granted permanent commns. as Pilot Officers on probation, with effect from and with seniority of May 19 :—363771 Sergeant W. C. Sheen, 363737 Sergeant H. V. Satterly, 363571 Sergeant D. D. Christie. Lieut. J. P. Domvile, R.A.R.O., is granted a short-service commn. on Supplementary List as Flying Officer, with effect from May 16, and with seniority of July 16, 1921. The following Pilot Officers are promoted to rank of Flying Officer :—J. E. Beynon (March 14) ; G. S. King (April 8) ; M. P. O'Reilly (April 8) ; J. D. H. Slade (April 12) ; R. I. Johnson (Sec. Lieut., 67th Fd. Bde., R.A., T.A.) (May 2).

Pilot Officer on probation F. N. Hemphill relinquishes his short-service commn. on account of ill-health (May 28). The short service commn. of Pilot Officer on probation E. H. Jennings is terminated on cessation of duty (March 27).

Stores Branch

Flying Officer A. Amy is transferred to Reserve, Class B (May 25).

Memorandum

181586 Cadet A. F. Watkinson is granted an hon. commn. as a Sec. Lieut. with effect from date of demobilisation.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following are granted commns. in Class A.A. (ii) as Pilot Officers on probation :—I. R. Scott (May 12) ; E. Cramp (May 15). Flying Officer J. C. Joynt is transferred from Class B to Class C (April 20).

ROYAL AIR FORCE INTELLIGENCE

Appointments—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commander J. A. G. De Courcy, M.C., to H.Q., Coastal Area, for Engineer Staff duties, 14.5.30.

Wing Commander A. Corbett-Wilson, to School of Tech. Training (Men), Manston, for Engineer duties, 31.5.30.

Squadron Leaders :—J. Noakes, A.F.C., M.M., to R.A.F. Depot, Uxbridge, 9.5.30. V. R. Gibbs, D.S.C., to H.Q., R.A.F., Transjordan and Palestine, 15.4.20. H. A. Whistler, D.S.O., D.F.C., to Central Flying School, Wittering, 12.5.30. W. B. Everton, to R.A.F., M.T. Depot, Shrewsbury, 7.5.30. E. J. D. Routh, to No. 29 Sqdn., North Weald, 2.5.30.

Squadron-Leader T. W. Elmhirst, A.F.C., to H.Q., R.A.F., Mediterranean, 23.5.30.

Flight-Lieutenants :—R. C. Savery, D.F.C, to No. 9 Sqdn., Manston, 10.5.30. P. R. T. J. M. I. C. Chamberlayne, A.F.C., to R.A.F. Training Base, Leuchars, 10.5.30. N. C. Saward, to No. 54 Sqdn., Hornchurch, 8.5.30. C. A. B. B. Wilcock, A.F.C., to H.Q., Iraq Command, instead of to Armoured Car Wing as previously notified, 29.3.30. G. V. Howard, D.F.C., to No. 4 Flying Training Sch., Egypt, 1.5.30. E. D. M. Hopkins, to Armament and Gunnery School, Eastchurch, 17.4.30. A. J. Holmes, to R.A.F. Depot, Uxbridge, 17.4.30. E. H. D. Spence, to R.A.F. Training Base, Leuchars, 27.4.30. N. Young, to No. 441 (Fleet Spotter Reconnaissance) Flight, 27.4.30. G. C. A. Armstrong, to No. 1 Flying Training School, Netheravon, 18.5.30.

Flight-Lieutenants :—R. E. Meek, to R.A.F. Base, Calshot, 20.5.30. T. G. Bird, to No. 16 Squadron, Old Sarum, 26.5.30. A. H. J. Howlett, to R.A.F. Depot, Uxbridge, 16.5.30. J. H. C. Wake, to Home Aircraft Depot, Henlow, 19.5.30. C. Guppy, to Oxford University Air Squadron, 21.5.30. L. J. Chandler, M.B.E., to R.A.F. Training Base, Leuchars, 16.4.30. R. M. C. Macfarlane, M.C., to Air Ministry (D.O.S.D.), 28.5.30.

Flying Officers :—E. S. Finch, to Central Flying Sch., Wittering, 12.5.30. G. J. Powell, to No. 608 Sqdn., Thornaby, 13.5.30. R. J. D. Drummond, to R.A.F. Base, Gosport, 12.5.30. J. B. Mackenzie, to R.A.F. Depot, Uxbridge, 1.5.30. M. J. Du Cray, to Aircraft Depot, Hinaidi, instead of to No. 84 Sqdn., as previously notified, 29.3.30. C. P. Ashton-Jinks, to Home Aircraft Depot, Henlow, 17.4.30. B. G. Farrow, to Aircraft Depot, India, 19.4.30. I. B. Beesley, to Central Flying School, Wittering, 20.5.30. H. J. A. Williams, to No. 31 Sqdn., India, 10.4.30. M. Griffiths, to No. 607 Sqdn., Usworth, 6.5.30. P. MacG. Watt to Central Flying School, Wittering, 14.5.30. J. P. Domville, to R.A.F. Depot, Uxbridge, on appointment to a Short-Service Commn., 16.5.30. R. J. Legg, to No. 604 Sqdn., Hendon, 19.5.30. D. T. Saville, to No. 207, Sqdn., Bircham Newton, 19.5.30. S. L. Blunt, to R.A.F. Depot, Uxbridge, 12.4.30. F. Read, to No. 25 Sqdn., Hawkinge, 13.5.30.

Flying Officers : S. F. Cole, to No. 1 School of Tech. Training (Apprentices), Halton, 29.4.30. H. G. Wisher, to Home Aircraft Depot, Henlow, 26.4.30. P. J. Stapleton, to Home Aircraft Depot, Henlow, 26.4.30. W. L. Freebody, to Home Aircraft Depot, Henlow, 26.4.30. R. J. Cooper, to No. 4 Flying Training School, Egypt, 17.5.30. F. Miller, to R.A.F. Practice Camp, North Coates Fitties, 21.5.30. F. K. Wood, to Station H.Q., Mount Batten, 24.5.30.

Pilot Officers :—R. D. Cotton, to No. 32 Sqdn., Kenley, 8.5.30. G. D. Hoyland, to No. 33 Sqdn., Eastchurch, 28.4.30. E. F. J. L'Estrange, to R.A.F. Depot, Uxbridge, 1.5.30. D. Carr, to No. 3 Flying Training Sch., Grantham, 26.4.30. W. J. Scott, to No. 3 Flying Training Sch., Grantham, 26.4.30, J. H. Bell, to No. 3 Flying Training Sch., Grantham, 26.4.30. F. A. McNeill. to No. 30 Sqdn., Iraq., instead of to No. 55 Sqdn. as previously notified, 29.3.30. R. P. Cauthery, to No. 27 Sqdn., India, 9.4.30. H. M. B. Collin to No. 60 Sqdn., India, 9.4.30. C. E. Hartley, to Aircraft Depot, India, 9.4.30. C. S. Millar, to No. 11 Sqdn., India, 9.4.30. H. B. Robertson, to No. 70 Sqdn., Iraq, 10.4.30. K. A. K. MacEwen, to No. 19 Sqdn., Duxford, 8.5.30. G. H. Clarke, to No. 17 Sqdn., Upavon, 16.5.30.

Accountant Branch

The undermentioned Pilot Officers are posted to H.Q., R.A.F., Cranwell, on appointment to Permanent Commns. on probation with effect from 2.6.30 :—D. Lumgair, C. G. Sharp, C. A. Proffitt, P. Griffiths, R. Peel, J. G. Wigley, W. J. R. Cann, R. F. Fleming.

Medical Branch

Squadron-Leader A. Briscoe, to R.A.F. Depot, Uxbridge, 30.4.30.

Flight-Lieutenant G. W. McAleer, to Home Aircraft Depot, Henlow, 19.6.30.

IN PARLIAMENT

Airships

MR. MONTAGUE, on May 21, in reply to Lt.-Com. Kenworthy, said : No decision has been or will be taken in regard to future airship construction policy pending further progress with the programme of experimental flights to be carried out by the R 100 and R 101.

Lt.-Com. Kenworthy : May we take that reply as a denial of the report which appeared in the *Daily Herald* that a great airship was to be built ?

Mr. Montague : I cannot see that I am called upon either to confirm or to deny newspaper reports. Probably the basis of that report was that the Airship Guarantee Co., Ltd., has been given a designing contract by the Air Ministry in order to keep their technical staff in being, in the event of new construction being approved.

Wireless Telephony and Aircraft

MR. MONTAGUE, in reply to Mr. Everard, said the civil aerodromes at Croydon and Lympne and the airship station at Cardington have means of regular communication by wireless telephony with civil aircraft. In addition, the wireless telegraphy stations at Pulham and Renfrew have telephony equipment. Experiments for instructional purposes in communication by wireless telephony from the ground to aircraft in flight are being conducted at the civil aerodrome at Heston. The question of giving assistance at other civil aerodromes is under consideration.

Light Aeroplane Clubs

MR. LOUIS SMITH asked whether, in view of the subsidy given to light aeroplane clubs, any condition is made to the effect that the aeroplanes used by members must be of British manufacture ?

Mr. Montague : Such a condition has not been considered necessary in the agreements hitherto made with the clubs, in view of the obviously outstanding merits of British light aeroplanes and the extreme improbability of any of the clubs wishing to purchase from abroad. The question of including a stipulation of the sort in the new agreements will be considered.

Low Flying

MR. MONTAGUE, on May 28, in reply to Mr. Day, said action has been taken in a number of cases during the past 12 months against either Royal Air Force and civil pilots for flying at a low altitude or in proximity to persons or dwellings in which unnecessary danger has been caused. Such action has taken the form, where Royal Air Force pilots have been concerned, of bringing the alleged offender to trial by court-martial in a really serious case. In other cases pilots have been dealt with summarily under the Air Force Act or other appropriate disciplinary action has been taken against them. Where civil pilots are concerned, the institution of legal proceedings is a matter for the civil police and not for the Air Ministry. Each complaint has, however, been investigated by the Air Ministry and taken up, where the circumstances warranted it, with the owner or pilot of the aircraft concerned, with a view to the prevention of similar cause for complaint in the future. There were eight cases in which pilots were tried by court-martial.

Airship R 100.

MR. MONTAGUE, in reply to Dr. Morris-Jones and Mr. D. G. Somerville, said the trial flight of R 100 was undertaken mainly to test the new engines installed for the Atlantic flight and the modifications to the outer cover wiring arrangements. The test was quite satisfactory as regards the engines, but on arrival at Cardington it was seen that the tail fairing piece, which is intended to improve the flow of air at the tail of the airship, was buckled, and subsequent inspection showed also that in one bay, behind one of the power cars, the force of the slipstream had damaged the cover and the securing wires and tapes. The failure of the fairing piece is due to its having been built of too light a gauge, and it will now be reconstructed in material of heavier gauge and with additional stiffening. The damage to the outer cover will be remedied by inserting intermediate girders in this bay, a method which has proved successful in other bays where trouble has been experienced. Although the damage was of a minor nature, and those on board the airship were unaware of it, the repair will take a little time, the new material having to be specially manufactured. Consequently, it has been necessary to postpone the flight to Canada until the end of June or beginning of July next.

Aircraft Manufacture and American Mission

MR. HANNON asked the Under-Secretary of State for Air whether his attention has been drawn to the organisation of an American mission to visit this and other European countries for the purpose of opening up new markets for the sale of aircraft produced in the United States : and, seeing that American aircraft manufacturers have large stocks now upon their hands, will he adopt any measures to protect the interests of aircraft manufacturers in this country against competition of the nature indicated

Mr. Montague : I understand that an American commercial aviation mission is to visit various European countries, but so far as I am aware Great Britain is not included in its itinerary, and I have no evidence to show that the situation referred to in the second part of the question will arise. In any case, the outstanding excellence of the products of British aircraft manufacturers is so well-known the world over that I feel confident they will be quite able to hold their own against competition.

MODELS

THE MODEL AIRCRAFT CLUB (T.M.A.C.)

MEMBERS possessing power-driven fuselage models, are reminded that there is a competition for this type of model, particulars of which are given below.

Sir John Shelly Cup.—Saturday, June 14, at Wimbledon Common.

1. The competition to be for duration of fuselage models (fuselages must comply with the S.M.A.E. formula).
2. Only mechanical power plant to be used (not rubber).
3. The models must rise from the ground, under their own power.
4. The best of the three flights to count.

The Competition Secretary will be pleased to receive suggestions for future competitions. They should be sent to :—Mr. T. Newell, 32, Veroan Road, Bexley Heath, Kent.

Hon. Secretary, A. E. Jones, 48, Narcissus Road, West Hampstead, N.W.6.

WESTLAND AIRCRAFT SOCIETY, MODEL SECTION

The desire for the formation of a Model Section was evinced by the rally of some 25 model aeroplanes at the inaugural meeting of this recently-formed Section of the activities of the Westland Aircraft Society, on the Aerodrome, on Thursday last, May 29. Some remarkably good flights were made by the models, although mostly of the "flying stick" type, but it is the intention of the members to produce scale models of existing aircraft. The formation of the Section also provides scope for ingenuity and new ideas.

Following Thursday's meeting, Mr. Voss gave an interesting talk on "Models and Model Making," in the Works' Canteen, which was attended by some 35 members and prospective members.

Under the chairmanship of Mr. W. Geo. Gibson, the following Committee has been appointed :—Messrs. E. Voss, W. E. Cochrane, M. Ring and C. Rowe. Mr. Cecil J. King is Secretary and Treasurer of this Section.

The Westland Aircraft Society has a total membership of 359. Already the nucleus of an interesting Winter Session is in hand, and a promise has been given by Capt. C. D. Barnard to lecture on his recent return flight to the Cape.

A REALISTIC MODEL DISPLAY: Above we show a representation of Stag Lane Aerodrome displayed in the window of E. A. Skinner and Co., Ltd., the well-known Bond Street jewellers. The models are the work of the Models Manufacturing Co., of Newington Causeway, S.E.1.

AIR MINISTRY NOTICES

AIR MINISTRY NOTICES TO AIRMEN

Cranbrook Air Light : Altered Period

1. As from the evening of Wednesday, May 28, 1930, and until further notice, the period of the Cranbrook air light will be increased from 7 secs. (as at present shown in *The Air Pilot*, Vol. I, page 37) to 10 secs. The new characteristics of this light will be approximately as follow :—

Light 0·15 sec. ; eclipse 0·7 sec.
Light 0·15 sec. ; eclipse 0·7 sec.
Light 0·15 sec. ; eclipse 8·15 secs.

2. This alteration is experimental only and is designed to increase the range of visibility of the light by prolonging the duration of each of the three flashes.

3. All pilots are requested to observe the Cranbrook air light on all possible occasions, and compare its visibility with that of the Tatsfield air light, the period which, viz., 7 secs., will remain unchanged for the present. Reports of any observations or comparisons so carried out should be addressed to the Secretary, Air Ministry (C.A.4), Gwydyr House, Whitehall, S.W.1, as soon as possible.

Navigational Warning (*No.* 11 *of* 1930).

Night Flying without Navigation Lights

ROYAL Air Force aircraft will be flying nightly between 1900 and 2400 hours, during the periods mentioned, over the areas described below. Above the altitudes quoted, the aircraft will not exhibit navigation lights, unless other aircraft are observed in their vicinity.

1. *Area.*—Eastward of straight lines joining Dungeness, Lympne and Dover. *Period.*—June 2, 1930, to July 12, 1930, inclusive. *Altitude.*—5,000 ft.
2. *Area.*—Within the area bounded by straight lines joining Minehead, Stert Point, Watchet and Minehead. *Period.*—From June 8, 1930, to September 7, 1930, inclusive. *Altitude.*—3,000 ft.
3. *Area.*—Eastward of straight lines joining Herne Bay, Canterbury and Deal. *Period.*—June 22, 1930, to August 17, 1930, inclusive. *Altitude.*—3,000 ft.

Navigational Warning (*No.* 12 *of* 1930)

AIR MINISTRY NOTICE TO AIRCRAFT OWNERS AND GROUND ENGINEERS

Radio Receiving Sets in Civil Aircraft

1. WHERE radio receiving apparatus is voluntarily carried in aircraft when not required by A.N.D. 7P, para. 62, such receiving apparatus need not be of an approved type.
2. The installation of such apparatus does, however, constitute a modification of the aircraft, as prescribed in A.N.D. 7, para. 35, and approval of the method of installation is necessary.

(*No.* 17 *of* 1930.)

PUBLICATIONS RECEIVED

How to Become an Air Pilot. By R. L. Preston. London : Sampson Low, Marston and Co., Ltd. Price 3*s.* 6*d.* net.

The National Physical Laboratory Report for the Year 1929. H.M. Stationery Office, London, W.C.2. Price 11*s.* net.

NEW COMPANY REGISTERED

HOME COUNTIES AIRCRAFT SERVICES, LTD., 3, The Priory, Tunbridge Wells, Kent. Capital £2,500 in £1 shares. Acquiring the business of an aircraft proprietor and instructor in aviation carried on by R. B. Waters at Penshurst, Kent, and elsewhere. Directors :—R. B. Waters, Penshurst Aerodrome, Penshurst, Kent. C. R. Robinson, 3, The Royal Chase, Tunbridge Wells.

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations* : Cyl. = cylinder ; i.c. = internal combustion ; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1929

Published June 5, 1930

3,927. G. BENNIE. Braking means. (328,946.)
4,387. SOC. DES AVIONS BERNARD. Wings or planes. (305,675.)
9,959. I. SILLITTI. Aircraft. (329,097.)
10,623. SPERRY DEVELOPMENT CO. Gyroscopic apparatus for defining a vertical reference plane. (309,150.)
11,832. A. A. KUCHER. Aircraft. (329,121.)
13,545. V. J. BURNELLI. Radiators. (329,140.)
18,266. M. J.-BARBAROU. Change-speed gearing. (329,199.)
19,803. SPOLECNOSTRO. LETECKY PRUMYSL SPOLECNOST S.R.O. Compressed-air installation for aircraft. (314,449.)

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